# 'Waste', Value and Informal Labour: The Regional E--Waste Recycling Production Network in Malaysia and Singapore.

Wong, Aidan Marc Yew Fai

# 'Waste', Value and Informal Labour: The Regional E-Waste Recycling Production Network in Malaysia and Singapore

Aidan Marc Yew Fai Wong

School of Geography
&
School of Business and Management
Queen Mary University of London

Thesis submitted for the degree of
Doctor of Philosophy

May 2014

## Statement of Originality

I, Aidan Marc Yew Fai Wong, confirm that the research included within this thesis is my own work or that where it has been carried out in collaboration with, or supported by others, that this is duly acknowledged below and my contribution indicated. Previously published material is also acknowledged below.

I attest that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge break any UK law, infringe any third party's copyright or other Intellectual Property Right, or contain any confidential material.

I accept that the College has the right to use plagiarism detection software to check the electronic version of the thesis.

I confirm that this thesis has not been previously submitted for the award of a degree by this or any other university.



Signature: Aidan Marc Yew Fai Wong
Date: 8th May 2014

## Abstract

This thesis examines the regional electronic and electrical waste (e-waste) recycling network in Malaysia and Singapore, with a secondary focus on the articulations of informal labour within the network. I argue that there is a need to theorise production networks *post*-consumption; i.e. to focus on the activities and processes that occur after a commodity is consumed and subsequently discarded. I argue that discarded e-waste are not 'value-less' waste, but instead embody value (specifically latent use value), and have the potential to be re-inserted as 'raw materials' into production networks through the processes of recycling. Also, key to the processes of value (re)creation, enhancement and capture is the labour process. I examine informal labour by focusing on *karung guni* (a local term for the rag-and-bone man) – analysing their critical role in value (re)creation in this regional e-waste recycling production network through the lens of petty commodity production. I argue that *karung guni* are constitutive of this production network through their collection and primary processing of e-waste, which forms the basis for subsequent value creation, enhancement and capture by downstream actors. Conceptualising *karung guni* as petty commodity producers – who own both the means of production and their own labour power – is significant in problematising as not so straightforward the separation of capital and labour into discreet categories as normally presented in global value chains (GVC)/global production networks (GPN) approaches.

This thesis makes four significant contributions to the GVC/GPN literature. First, it recognises activities beyond the point of consumption (which has been the focus of present GVC/GPN research). Second, it conceptualises the constitutive role of informal labour in the development and structure of production networks. Third, it emphasises the continued relevance of the state. Fourth, by adopting a multi-sited case study method, it contributes to debates on how to carry out GVC/GPN research.

# Acknowledgements

My first thanks goes to God for the many graces He has showered on me.
*Servite Domino in Laetitiae!*

To Dad, Mum, Aunt Catherine, Jill, Cyril and Cheryl, Mikaela and Zachary: I am eternally grateful for your prayers, support and encouragement. This thesis is dedicated to you and our extended family. To all of you I am forever indebted.

To my supervisors, Adrian Smith and Liam Campling: I am ever thankful for your patience, advice, candour and encouragement throughout this process. Your guidance has been instrumental in seeing me through. Words cannot fully express the debt of gratitude that I owe to you both.

To my QMUL friends, in particular: Erica Pani, Helen Rawling, Joshua Phillips, Harold Lovell, Menah Raven-Ellison, Ginny Benardout, Eilidh Reid, Steffen Fischer, Jenny Murray, Al James, Laura Humphreys, Oliver Gibson, Robert Stephenson, Hayley Peacock, Nana Osei, Victoria Pickering, Megan Ryburn, Prima Sekarsari, Suzy Solley, Kieran Stanley, and Annabelle Wilkins. Thank you for making my time at QMUL such a blast. It would have been absolutely impossible without you!

To Henry Yeung and Tracy Skelton: I am truly grateful to the both of you for encouraging me to undertake this PhD. You are both inspirations to me, and I am immensely appreciative of your constant reassurance and support.

To the amazing scholars that I have had the honour of meeting over the course of my PhD programme, in particular: Jennifer Bair, Trevor Barnes, Stephanie Barrientos, Neil Coe, Martin Hess, Alex Hughes, Phil Kelly, Kirsty Newsome, John Pickles, Helen Rainbird, Pamela Robinson and Phil Taylor. Thank you for the intellectual engagement and scholarly debates. Your perspectives have contributed greatly in expanding my horizons.

To Geraldine Foo, Tracy Lee, Jonathan Quek, Jilyn Tan, and Wong Yui Min, and all your families (The Dim Sum Gang): May our friendship ever grow and be assured that your presence in my life is cherished always.

To Chip and all my wonderful friends in Cardiff: Thank you for sharing with me all the wonderful times in Cardiff and for the warmth and care which you have shown me!

To J: Thank you for your continuous support and concern for me. Your presence in my life has been truly a blessing.

To Deborah, Edwin, Gilbert, Liangwei, Meng Chuan and Rosie: Thank you for always being there to listen to me rant, to give me encouragement, and for being an ever reliable support in my life.

To Joanne Ng: Thank you so much for helping me sharpen my thoughts and arguments, and for reminding me to keep my sentences short and focussed! You are a god-send!

To Chiehshen, Fernn, Jerrold, Joanna, Kai Xiang, Kelvin and Shawn: Thank you for making the time in London enjoyable! I leave London with many fond memories. See you back in Singapore!

To Eric, Allison, Audrey, Erina and Christopher: Thank you for all your prayers, love and support throughout this journey. I am truly blessed to be included as part of your family.

To my interviewees who shared their opinions, thoughts, and lives with me, I am most grateful for your friendship and participation in this research project.

Finally, I would like to acknowledge the financial support received from the Dudley Stamp Memorial Trust, Queen Mary University of London Central Research Fund, Queen Mary Postgraduate Research College Studentship Award, and Royal Geographical Society - Developing Areas Research Group Travel Award.

Aidan Marc Wong (May 2014)

# 'Waste', Value and Informal Labour: The Regional E-Waste Recycling Production Network in Malaysia and Singapore

TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# LIST OF ABBREVIATIONS

| | |
|---|---|
| **ASEAN** | Association of Southeast Asian Nations |
| **CPU** | Central Processing/Processor Unit |
| **CtMfPng** | Contract Manufacturer, Penang |
| **CtMfSgp** | Contract Manufacturer, Singapore |
| **DOE** | Department of Environment, Malaysia |
| **EERpSgp** | Electrical and Electronic Repair Shop Owner, Singapore |
| **ENGOPng** | Environmental Non-Governmental Organisation, Penang |
| **FEWKul** | Formal E-waste Wholesaler, Kuala Lumpur |
| **FEWPng** | Formal E-waste Wholesaler, Penang |
| **FEWSgp** | Formal E-waste Wholesaler, Singapore |
| **FRERKul** | Full Recovery E-waste Recycling Firm, Kuala Lumpur |
| **FRERPng** | Full Recovery E-waste Recycling Firm, Penang |
| **FRERSgp** | Full Recovery E-waste Recycling Firm, Singapore |
| **GCC** | Global Commodity Chains |
| **GPN** | Global Production Networks |
| **GVC** | Global Value Chains |
| **GvtKul** | Municipal Government Official, Kuala Lumpur |
| **GvtMys** | Federal Government Official, Federation of Malaysia |
| **GvtPng** | State Government Official, Penang |
| **GvtSgp** | Government Official, Republic of Singapore |
| **HDB** | Housing and Development Board, Singapore |
| **IEWKul** | Informal E-waste Wholesaler, Kuala Lumpur |

| | |
|---|---|
| **IEWPng** | Informal E-waste Wholesaler, Penang |
| **IEWSgp** | Informal E-waste Wholesaler, Singapore |
| **KGKul** | Karung Guni, Kuala Lumpur |
| **KGPng** | Karung Guni, Penang |
| **LKGSgp** | Licensed Karung Guni, Singapore |
| **MSW** | Municipal Solid Waste |
| **MSWFKul** | Municipal Solid Waste Collection Firm, Kuala Lumpur |
| **MSWFPng** | Municipal Solid Waste Collection Firm, Penang |
| **MSWFSgp** | Municipal Solid Waste Collection Firm, Singapore |
| **MYR** | Malaysian Ringgit |
| **NEA** | National Environment Agency, Singapore |
| **OBMPng** | Original Brand Manufacturer, Penang |
| **OBMSgp** | Original Brand Manufacturer, Singapore |
| **PCP** | Petty Commodity Production / Producer |
| **PHResSgp** | Public Housing Resident, Singapore |
| **PRERKul** | Partial Recovery E-waste Recycling Firm, Kuala Lumpur |
| **PRERPng** | Partial Recovery E-waste Recycling Firm, Penang |
| **PRERSgp** | Partial Recovery E-waste Recycling Firm, Singapore |
| **SGD** | Singapore Dollar ($) |
| **SMEPng** | Small and Medium Enterprise, Penang |
| **SMESgp** | Small and Medium Enterprise, Singapore |
| **TCWCSgp** | Town Council Waste Collector, Singapore |
| **UKGSgp** | Unlicensed Karung Guni, Singapore |
| **USD** | United States Dollar ($) |

# Chapter 1

## Introduction

## 1.0 Introduction

> He honks his hand-horn while shouting out loud: '*Karung guni*! *Karung guni*!' He pauses in his footsteps for a moment. The perspiration streaming from his temples are but one sign of the difficult life he has led these past twelve years. His hands are calloused and have multiple cuts. His voice has gone slightly hoarse because of the constant shouting. Yet he persists, he perseveres. He shouts again: '*Karung guni*! *Karung guni*!' In this way, he makes his presence known to the households in the estate. He waits for a response from someone who would be keen on selling him their waste. Someone from a window shouts back to him to get his attention. The lady in the window waves at him. He smiles – he knows she has something to sell. He hopes it is something valuable. She has a computer and an LCD monitor that her son wants to discard. It is only about four years old. He tells her they are worth SGD 10 (≈ USD 7.91). She agrees. She just wants the junk out of her door. She complains that it has been cluttering the house while she has waited for him to come on his rounds. He apologises, and says that the heavy rain recently has made it difficult to do his rounds. He is happy that he has another computer and monitor to dismantle and sort into components. He is hoping there are some working parts in it. The real value of what he has bought is much more than SGD 10, but the lady who sold them to him is oblivious to the 'treasure' that she has just let slip from her hands. He places the computer and LCD monitor on his handcart, and grins at me. The work has only just begun.
>
> (Field Notes #6, Singapore)

The above was extracted from a short reflection written after a day of accompanying a *karung guni* on his collection rounds, and having returned to his flat in Bukit Ho Swee, Singapore, to observe him dismantling and sorting the components of the CPU and LCD monitor. We shared a simple dinner that I insisted on buying at the coffee shop nearby. *Karung guni*, a local term which refers to both male and female itinerant rag-and-bone collectors in Malaysia and Singapore, collect a myriad of discarded goods from households and small businesses,

including electronic and electrical waste, newspapers, aluminium cans, cardboard, old clothes and broken toys. Through interviews with 87 *karung guni* and accompanying 56 of them on various occasions as they bought and collected, dismantled and disassembled, sorted, and sold their primary processed e-waste to e-waste wholesalers, I was privileged to gain insights into their lives that demonstrated the processes of value (re)creation and the integral role of *karung guni* in the regional e-waste recycling network in Malaysia and Singapore.

This thesis focuses on two objects of empirical inquiry arising from an analysis of the regional e-waste recycling network. First, it examines electronic and electrical waste (henceforth e-waste). E-waste is produced when electronic and electrical products are discarded by their initial owners and includes production scrap and defective components from the manufacture of electronic and electrical products (Hieronymi et al. 2012). In this thesis, I argue that waste embodies value even after it has been discarded, and through the labour process, value is (re)created. Second, this thesis analyses the role of the informal sector in global production networks (Phillips 2011), focussing in particular on *karung guni* and their articulations with the regional e-waste recycling network in Malaysia and Singapore. To this end, I examine informal labour because of its centrality to the creation of value in the e-waste recycling network. I argue that informal labour is constitutive of this production network, as demonstrated by the pivotal role of *karung guni* in their collection and primary processing of e-waste.

The key concept of analysis in this thesis is value, and will be analysed through the lens of Radical Political Economy (RPE). This focus on value illuminates four

important issues that are discussed in this thesis. First, this thesis interrogates the politics and processes surrounding the creation, enhancement and capture of value in production networks through the e-waste circuit of capital as discussed in section 5.1 (see Figure 5.1), thus bringing to light the importance of the labour process to the creation of value. Second, the RPE approach that focuses on value illuminates the uneven distribution and capture of value among economic actors in production networks, which have significant impacts on the social reproduction and survival opportunities of economic actors, in particular *karung guni* who are driven into increasingly precarious livelihoods as discussed in Chapter 6. Third, an analysis of the movement of value in production networks provides an avenue to examine the exploitation of labour, in this case *karung guni*, in production networks (see sections 5.3 and 5.5.4). Fourth, through an analysis of the creation, enhancement and capture of value, this thesis sheds light on the various strategies deployed by economic actors in an effort to improve their value creation, enhancement and capture opportunities (see sections 5.5 and 6.3). Hence, the RPE approach – with its emphasis on value – is adopted in this thesis as an effective means of revealing the processes and politics in the regional e-waste recycling network in Malaysia and Singapore.

The generation of waste is an inescapable reality of modern life. Indeed, in contemporary society, it is difficult to escape the production of a 'new'-er type of waste – discarded electrical and electronic goods. Increasing at a significant rate – due mainly to the growing penetration of technology, and in particular electronic technologies, in everyday life across the world – the global production of e-waste is estimated to be around 40 million tonnes per annum and growing at a rate of 3% -

5% annually, ranking it as one of the fastest growing waste streams (Cui & Forssberg 2003; Jofre & Morioka 2005; Babu et al. 2007; Nnorom & Osibanjo 2008a; Osibanjo & Nnorom 2008; Schleup et al. 2009; Shekdar 2009; Chibunna et al. 2010; Nnorom et al. 2011; Kellenberg 2012). This rate is approximately three times faster than the rate of increase of general waste, and poses a significant problem to countries worldwide in terms of proper discard and management (Puckett et al. 2002). For example, it has been estimated that from the period of 1994 to 2003 approximately 500 million personal computers reached their obsolescence or were discarded, and this translates to around 718,000 tonnes of lead, 1,363 tonnes of cadmium, and 287 tonnes of mercury (Smith et al. 2006). Modern electronic and electrical products can contain as many as 60 different elements, which are often of significant economic value, sometimes hazardous, and occasionally, both (UNEP 2004a; UNEP 2004b; UNEP 2006; UNEP 2007; UNEP 2012). A corollary of this growth in e-waste has been the increase in global e-waste trade that has been increasing exponentially and around "80 per cent ends up being shipped (often illegally) to developing countries to be recycled by hundreds of thousands of informal workers" (Lundgren 2012, p.5; Lundgren 2012, p.16). However, e-waste that is imported is not the only source. The increasing volumes of e-waste produced domestically is a reality that many developing countries will need to grapple with, as seen in the significant growth in e-waste produced in countries such as China and India (Rochat et al. 2008; Zhang 2009; Dwivedy & Mittal 2012). The proper and efficient management of e-waste is thus a daunting and urgent task that needs to address both its rapidly increasing volume and also its hazardous nature.

If not managed in an environmentally sound manner, and with proper safeguards to public health, e-waste can pose significant risks to the environment and to human health due to the numerous toxic substances in its contents. Some studies have suggested that around 9% of e-waste mass consists of toxic substances such as lead, cadmium, mercury and other toxic chemicals (see Sarkar 2008; Zheng et al. 2008; Marques et al. 2013). Cadmium in semiconductors, lead in computer monitors, lithium in mobile phone batteries, beryllium in computer motherboards and lead-acid batteries are just a sample of the harmful substances in e-waste that can be deleterious to human health and the natural environment. For example, an average desktop computer with a 15-inch cathode ray tube monitor weighs approximately 25 kilogrammes, and has the potential to contain as much as 2.5 kilogrammes of lead (Pinto 2008; Robinson 2009). However, while e-waste on the one hand contains toxic elements that are hazardous, they also consist of materials that are valuable and which can be recycled. For example, a mobile phone can contain more than 40 elements including copper, tin, cobalt, antimony, indium, and precious metals such as silver, gold and palladium and the controversial commodity, rare earth (Kreibe 2012). On average, metals account for around 23% of the total weight of the phone, with the majority being copper. These precious metals in e-waste have the potential to be recycled and (re)introduced into the production process, and it is these processes of recycling that this thesis focuses on. Table 1.1 provides an approximate guide to the amount of metals that can be found in mobile phones and computers. These metals, when disposed of as e-waste, are a veritable 'surface mine' or 'urban mine' that can be recycled to be used again in further production and manufacturing needs (Saphores et al. 2009; Kalana 2010; Hagelüken & Meskers 2012). Importantly, the recycling of precious metals

from e-waste may be instrumental in reducing the demand pressures placed on mining for virgin metals, in particular gold, copper and platinum group metals (Prakash & Manhart 2010).

**Table 1.1: Key Metals Present in Mobile Phones and Computers, 2007**

| *Electronic Product* | *Content Per Average Unit* | *Total Metal Used* |
|---|---|---|
| **Mobile Phones (1.2 Billion Sold in 2007)** | 250mg Silver | 300 tonnes of Silver |
| | 24mg Gold | 29 tonnes of Gold |
| | 9mg Palladium | 11 tonnes of Palladium |
| | 9g Copper | 11,000 tonnes of Copper |
| | 3.8g Cobalt | 4,500 tonnes of Cobalt |
| **Personal Computers and Laptops (255 Million Sold in 2007)** | 1.0g Silver | 255 tonnes of Silver |
| | 220mg Gold | 56 tonnes of Gold |
| | 80mg Palladium | 20 tonnes of Palladium |
| | 500g Copper | 128,000 tonnes of Copper |
| | 65g Cobalt | 6,500 tonnes of Cobalt |

Source: Hagelüken (2008); Hagelüken & Meskers (2012); Hagelüken (2013)

Effective and efficient recycling helps to ensure that e-waste is dealt with in an environmentally sound manner, and contributes to lowering greenhouse gas emissions by re-introducing raw materials into the production cycle, thereby reducing the pressures on mining for new raw materials. In a study of technology metals, it was found that 10 times more energy is used to produce 1 kg of primary aluminium when compared to production via recycling. The extraction of more precious metals from the earth creates even more significant environmental damage – one tonne of computer motherboards contains approximately 250g of gold, whereas in South African gold mines gold is found in concentrations of around 5g per tonne of rock and has to be mined to a depth of around 3 km (Hagelüken & Meskers 2012, p.55). Compared to the often small amount of

valuable elements (including gold, silver and copper), there is often a large volume of toxic substances (including heavy metals, brominated flame retardants and other harmful chemicals) that are released into the surrounding environment and atmosphere during crude processes of e-waste recycling. These crude processes of e-waste recycling include the burning of wires in barrels to strip the plastic casings and reveal the copper wires, and the soaking of motherboards in acid baths to allow for the removal of metal components. These toxic substances pose a threat not only to the health and wellbeing of the people directly involved with the processes, but also to the environment at large (Puckett et al. 2002).

This problematic has been described as an "e-waste tsunami" (Ni & Zeng 2009), emphasising the anticipated continued increase in e-waste production worldwide. In section 1.1, I position this thesis in relation to: (1) Global Value Chains (GVC)/ Global Production Networks (GPN) approaches; (2) labour issues; and (3) discussions on e-waste. Section 1.2 presents the aims and contributions of this thesis. In section 1.3, I briefly discuss the e-waste trade in Malaysia and Singapore, and justify the choice of Malaysia and Singapore as key sites for the investigation of global flows of e-waste. In section 1.4, I present the outline of this thesis.

## 1.1 Positioning the Research

This thesis employs the global value chain and global production network approaches as methodological and investigative tools to analyse the regional e-waste recycling network in Malaysia and Singapore. The primary focus of this

thesis is to examine the (re)valorisation of e-waste, and to uncover how e-waste is recycled and (re)introduced into the production process as 'raw material'. In this way, this thesis aims to employ GVC/GPN approaches as tools to identify and examine the politics, practices, and people that surround this process. The GVC/GPN approaches have been influential in shaping policy at the international level. The past decade has seen the adoption of these approaches by international organisations such as the Commonwealth Secretariat (Banga 2013a), the World Bank (Cattaneo et al. 2010), the World Economic Forum (2012), the Organisation for Economic Co-operation and Development (OECD 2007; Miroudot & De Backer 2012; Backer & Miroudot 2013; OECD 2013), the World Trade Organization (WTO 2011; UNCTAD-WTO-OECD 2013; Elms & Low 2013), the International Monetary Fund (IMF 2013a), the United States International Trade Commission (Wang et al. 2009; Powers & Riker 2013; Jones et al. 2013), and the United Nations Conference on Trade and Development (UNCTAD 2013; Banga 2013b; UNCTAD 2014). This is linked to a large body of academic literature that has emerged in the past twenty years coalesced around issues of global inequality and regional development (see section 2.1).

Within this academic literature, there has been a growing interest in re-focusing theoretical and empirical attention away from the processes of production and manufacturing towards issues surrounding *post*-consumption. (Lepawsky & McNabb 2010; Lepawsky & Billah 2011; Brooks 2013; Herod et al. 2013; Herod et al. 2014). In so doing, these scholars aim to account for the inter-linked nature of production and consumption, by shedding light on the way in which wastes that are discarded are re-inserted into production through processes of recycling. In

contrast to the Science and Technology Studies (STS) approach adopted by Josh Lepawsky and his co-researchers (2010; 2011; 2014) and by Gregson et al. (2010; 2013), which emphasizes the materiality of waste, and traces the material transformations of waste, this thesis adopts a Radical Political Economy (RPE) approach that emphasises the concept of value in waste, particularly e-waste, and is focussed on the analysis of the creation and flow of value within the production network to illuminate the uneven distribution of value among economic actors and regions that are articulated in the production network. The RPE approach is of particular importance in shedding light on the exploitative nature of the social relations of production (Elson 1979), and in this way, provides a means to analyse the economic precariousness of *karung guni* in the regional e-waste recycling network in Malaysia and Singapore.

With reference to labour studies, the thesis analyses the articulation of the informal sector, focussing on *karung guni* in the regional e-waste recycling network in Malaysia and Singapore. In this sense, the thesis analyses how the informal sector is intimately linked with the formal sector in multiple ways, and this is demonstrated through an examination of the practices of *karung guni*, in particular on their collection and primary processing of e-waste which forms the basis for the (re)creation, enhancement and capture of value by subsequent downstream actors. Informal labour (in particular *karung guni*) is thus central to e-waste recycling. Taken in this sense, *karung guni* are constitutive of the regional e-waste recycling network in Malaysia and Singapore. The informal sector continues to be an important part of the contemporary economy and has been the research focus of various international organisations such as the World Bank,

International Monetary Fund, the International Labour Office (Bangasser 2000; Blunch et al. 2001; Canagarajah & Sethuraman 2001; Barrientos & Barrientos 2002; ILO 2002a; ILO 2002b; Lund & Nicholson 2003; Perry et al. 2007a; Vuletin 2008; Abdih & Medina 2013). The research interest into the articulations of the informal sector underscores the continued significance of informal labour to the development and structure of global production networks.

This thesis interrogates the flows of e-waste in Malaysia and Singapore, and aims to uncover the social relations of production therein among actors in this network. In this way, the thesis aims to examine the strategies of firms to increase their potential for value creation, enhancement and capture through their appropriation of value from *karung guni*, and also analyse the strategies that *karung guni* employ to ensure that they have sufficient means for social reproduction and survival. In addition, this thesis contributes to debates on the global flows of e-waste through an investigation of the trade in e-waste between Malaysia and Singapore (Lepawsky & McNabb 2010; Lepawsky & Billah 2011). Indeed, the volume of e-waste produced globally has been growing at a significant rate, and is often attributed to the desire to "bridge the digital divide".

The eagerness to "bridge the digital divide" has created an avalanche of e-waste that became apparent from the 1980s with the introduction of the Basel Convention on the Transboundary Movement of Hazardous Wastes (Compaine 2001; Cullen 2001; Norris 2001; Selwyn 2004; Dewan & Riggins 2005; Servon 2008). The increased consumption of electrical and electronic goods has led to ever growing volumes of e-waste that are exported overseas for processing. This

has gained international attention due to the unsafe conditions under which e-waste is managed, processed and recycled (Yu et al. 2006; Janz & Bilitewski 2008; Rochat et al. 2008; Zhang 2009). Analysing the growth of e-waste in Asia, Minter & Pollack (2011, n.p.) argued that "whether it's production scrap and defective products from the region's many electronics manufacturers or goods purchased by residents rapidly crossing the digital divide, the e-scrap supply in Asia is sizable and growing. The supply of obsolete personal computers generated in the developing world will actually exceed that generated in the developed world within five to seven years". According to StEP (2013), Singapore's e-waste generated per capita exceeds that of the United Kingdom by more than 50 percent and the United States of America by more than 20 percent, reflecting the higher penetration rates of electronic and electrical products and is but one indication that places Malaysia and Singapore as key nodes in the global geographies of e-waste. Hence, this thesis aims to contribute to the body of scholarship on the geographies of waste by arguing that countries in the global 'South' are increasingly becoming key producers of e-waste, while emphasising that *karung guni* are constitutive of the regional e-waste recycling network in Malaysia and Singapore.

## 1.2 Thesis Aims and Contributions

The initial motivation to study *karung guni* and e-waste emerged out of an interest in understanding the constitutive role of labour in economic geographies, and is reflected in the identification of *karung guni* as the starting point for the analysis of

the regional e-waste recycling network in Malaysia and Singapore. While the research design is not explicitly comparative, contrasting phenomena in the thesis are highlighted where distinctive and geographically and/or socially specific characteristics are significant in shaping the different practices of actors in the regional e-waste recycling network in Malaysia and Singapore.

This thesis has four aims. First, this thesis aims at examining the processes of *post*-consumption, thereby shifting attention away from the present emphasis on production-distribution-consumption in GVC/GPN research. Importantly, this shift enriches GVC/GPN approaches by shedding light on the inter-linked nature of production networks, where the waste produced in one production network is used as the raw materials for another production network (Dicken 2011; Lepawsky & Mather 2011; Herod et al. 2013b; Herod et al. 2014). Relatedly, through an adaptation of Marx's (1956) circuit of capital, I argue that waste embodies latent use value and this value forms the basis for value (re)creation by *karung guni*. Importantly, the circuit of capital emphasises the significance of the labour process to the process of value (re)creation, as seen in the concrete labour of *karung guni*.

Second, through an examination of the articulations of *karung guni* with the regional e-waste recycling network in Malaysia and Singapore, the thesis aims to analyse the role and significance of informal labour to the development and structure of production networks. I argue that informal labour is constitutive of global production networks (Phillips 2011), as demonstrated by *karung guni* who perform the pivotal role of collecting and primary processing e-waste. To this end,

I conceptualise *karung guni* through the lens of petty commodity production (Bromley 1978; Moser 1978; Bromley & Gerry 1979; Gerry & Birkbeck 1981), and argue that through their ownership of both the means of production (i.e. e-waste) and their own labour power, they problematise as not so straightforward the normally presented separation of capital and labour in GVC/GPN analysis. Nonetheless, I argue that *karung guni* are more akin to labour because of their dependence on the formal sector for both their supply of 'raw' e-waste, and the subsequent purchase of primary processed e-waste by wholesalers and recycling firms. In their sale of primary processed e-waste to wholesalers and recycling firms, a portion of the surplus value created by *karung guni* is appropriated by wholesalers and recycling firms. Seen in this way, *karung guni* are exploited by wholesalers and recycling firms as disguised wage labour thus subjecting *karung guni* to increasingly precarious lives.

Third, this thesis aims to examine the role of the state in influencing the development and structure of production networks. In addition to its role in formulating and enforcing "regulatory mechanisms" (Bair 2005), states are also key providers of social security. To this end, this thesis contributes to theorisations of the state in GVC/GPN analysis by underscoring the importance of state subsidies to *karung guni* in their struggles to ensure social reproduction and survival. I interpret state subsidies in two distinct ways. First, state subsidies are a means to ensure the continued social reproduction of informal labour, thereby contributing to maintaining an available pool of 'cheap' labour. Second, state subsidies may be seen as a *de facto* subsidy to capital, as *karung guni* are less pressured into

negotiating higher prices with wholesalers and recycling firms to meet their minimum needs for social reproduction and survival.

Finally, this thesis aims to compare the e-waste recycling networks in Malaysia and Singapore through a multi-sited case study method. In so doing, the thesis also contributes to discussions on how to carry out GVC research (Neilson & Pritchard 2009). Relatedly, the thesis contributes empirically to research on the geographies of e-waste by studying the flows of e-waste in Malaysia and Singapore that are key nodes in the management and processing of e-waste on a global scale. The thesis hence aims to contribute to the many studies that have focused on the flows of e-waste in China (Yu et al. 2010; Chung & Zhang 2011; Wei & Liu 2012), India (Bandyopadhyay 2008; Janz & Bilitewski 2008; Rochat et al. 2008; Sarkar 2008; Dwivedy & Mittal 2013) and the African continent (Finlay 2005; Grant & Oteng-Ababio 2012; Lawhon 2012; Oteng-Ababio 2012; Lawhon 2013).

## 1.3 Understanding the Trade in E-Waste in Malaysia and Singapore

In order to understand the importance of Malaysia and Singapore in the global e-waste trade, this section presents a brief overview of the e-waste recycling industry in Malaysia and Singapore to contextualise the rest of the thesis.

*Karung guni* – a local term that means 'gunny sack' that they used to carry around to collect the discarded materials in – refers to the itinerant rag-and-bone waste collectors in Malaysia and Singapore and can be both male and female. The term

*karung guni* is used both in the plural and singular form. *Karung guni* collect a gamut of discarded goods, including e-waste (the focus in this thesis), newspapers, aluminium cans, cardboard, old clothes, toys, and almost anything that is discarded and perceived to be of value in their eyes. There is however, a clear gender division of labour in that in the case of e-waste *karung guni* in Malaysia and Singapore, this activity is performed entirely by male *karung guni*, with females collecting aluminium cans and cardboard. In addition, *karung guni* go by various names, depending on location. In Malaysia, *karung guni* are sometimes called *orang surat khabar lama* (loosely translated as the old newspaper man), or *keling botol* (loosely translated as the Indian bottle collector). Nonetheless, the term *karung guni* is used quite commonly in both Malaysia and Singapore, and hence is used throughout this thesis to denote the itinerant rag-and-bone man, who in this thesis, specialises in the collection of e-waste.

**Table 1.2: Selected Indicators from the Global Information Technology Report 2013**

| Indicator/Country | Malaysia | Singapore | United Kingdom | United States | Australia |
|---|---|---|---|---|---|
| Mobile Phone Subscriptions per 100 people (2011) | 127.0 | 150.2 | 130.8 | 92.7 | 108.3 |
| Individuals Using Internet (2011) | 61% | 71% | 82% | 77.9% | 79% |
| Households with Personal Computers (2010) | 64.1% | 86.1% | 84.6% | 75.5% | 82.6% |
| Households with Internet Access (2011) | 61.4% | 84.8% | 85.1% | 71.6% | 78.9% |
| Broadband Internet | 7.4 | 25.6 | 32.7 | 27.4 | 24.3 |

| | | | | | |
|---|---|---|---|---|---|
| Subscriptions per 100 people (2011) | | | | | |
| Mobile Broadband Subscriptions per 100 people (2011) | 12.3 | 114.1 | 52.6 | 74.5 | 73.0 |

Source: Bilbao-Osorio et al. (2013)

Adam Minter (2011) argued that Malaysia is 'in the middle' of the e-waste trade in Asia, with Singapore to the south – from whence it receives e-waste, and China, Thailand and Taiwan to the north, where it sends out recovered precious metals to be re-introduced into the production process. Indeed, Malaysia and Singapore are global traders of e-waste, and are increasingly becoming domestic producers of e-waste as well. Table 1.2 presents data from the Global Information Technology Report (Bilbao-Osorio et al. 2013) published by the World Economic Forum, and shows that Singapore exceeds or is similar to Australia, the United Kingdom and the United States of America in indicators including mobile phone subscriptions per 100 people, households with personal computers, households with internet access, and mobile broadband subscriptions per 100 people. The indicators shown here are suggestive of a significant amount of e-waste produced domestically in Malaysia and Singapore, particularly mobile phones.

The UNEP reported that Singapore was one of the world's top 10 net exporters of hazardous waste, including e-waste, during the period of 1993-1999, and stated that Malaysia receives a significant amount of hazardous waste from Singapore (UNEP & Secretariat of the Basel Convention 2002). Similarly, for the period 1993-1999, Malaysia was the world's 6$^{th}$ largest net importer of hazardous waste, including e-waste, and was in the top 10 traders in hazardous waste (UNEP &

Secretariat of the Basel Convention 2002). Hence, Malaysia and Singapore are not newly emergent locations for the processing of e-waste. Malaysia has been a node for scrap metal recycling since the 1990s, while Singapore has had businesses dealing in e-waste since 1988 (Kiser & Zagone 1996; AFP 2002). Moreover, Karin Lundgren (2012, p.16) has argued that "Singapore encourages imports of e-waste by deeming it non-hazardous (and thus not subject to regulation). Singapore has further announced a policy to become the recycling centre of the Southeast Asian region", thus suggesting that the government has taken the lead in positioning Singapore as a key node in the global trade in e-waste (see also Kojima 2005; Pavan 2013; Ryan 2013).

## 1.4 Thesis Outline

The thesis is divided into six further chapters.

**Chapter 2** sets the foundation for an analytically rich and empirically grounded investigation of e-waste and the already existing articulations of *karung guni* in Malaysia and Singapore. In this chapter, I provide a brief review of the literature around two approaches that have been formulated to conceptualise the relationships among the processes, politics and places of economic globalisation: global value chains (GVCs), and global production networks (GPNs). Through this analysis of the extant GVC/GPN literature, I identify two key lacunae that are investigated further through this thesis: (1) the practices and processes of *post*-consumption, in particular looking at e-waste. An investigation into the recycling

of e-waste is important in revealing the potential for value (re)creation, enhancement and capture; and (2) the importance of having a more nuanced consideration of the informal economy –specifically *karung guni* – in these two approaches, particularly through the lens of petty commodity production. An analysis of informal labour is important because of their pivotal role in the development and structure of production networks.

**Chapter 3** examines the methodology and methods adopted in this research. Here I discuss the importance of multi-sited case studies in understanding the linkages in the e-waste recycling network between Malaysia and Singapore. Importantly, the multi-sited case study method provides an avenue to tease out a comparative analysis of the data where relevant.

In **Chapter 4** I analyse the regional e-waste recycling network in Malaysia and Singapore. I operationalise the GVC/GPN approaches as investigative tools to interrogate four elements of the regional e-waste recycling network: (1) input-output structure; (2) chain governance; (3) global and national institutional contexts; and (4) territoriality/territorial embeddedness. These four elements were chosen for their ability in: first, identifying the relevant actors and relationships in this production network; second, identifying and analysing the key actors who control the chain; third, evaluating the role of global conventions such as the Basel Convention on the Transboundary Movement of Hazardous Wastes, and the role of states in influencing the development and structure of the production network; and fourth, analysing the co-constitutive role of space in

shaping the value (re)creation, enhancement and capture opportunities and potential of actors in this production network.

In **Chapter 5** I elucidate the processes and mechanisms that enable the revalorisation of waste. In this chapter, I adapt Marx's (1956) circuit of capital and argue that waste embodies value that is (re)created through the labour process. Importantly, this chapter highlights the conceptualisation of e-waste as a 'raw material' to be re-inserted into production. In addition, this chapter examines the dynamics of value accumulation and the various strategies employed by firms in the regional e-waste recycling network in Malaysia and Singapore to increase their potential and possibilities of value creation, enhancement and capture.

**Chapter 6** focuses on the articulations of *karung guni* with the regional e-waste recycling network in Malaysia and Singapore. Through the lens of petty commodity production, *karung guni* are conceptualised as embodying the contradictory unity of capital and labour. In this chapter, I argue that *karung guni* are constitutive of the regional e-waste recycling network in Malaysia and Singapore through their collection, disassembly and sorting of e-waste. Notably, this chapter sheds light on the various strategies which *karung guni* employ to ensure their social reproduction and survival.

**Chapter 7** concludes the thesis by presenting a summary of the key findings. I identify the contributions that the thesis makes –empirically and theoretically – to the body of GVC/GPN scholarship and literature on e-waste. I conclude by considering briefly the future possibilities for further research.

# Chapter 2

## Employing GVCs And GPNs

## – Expanding the Boundaries of Analysis

## 2.0 Introduction

The last 20 years have been marked by the proliferation of a rich body of literature that continues to focus on analysing dynamic patterns of global production, marked by arrangements of outsourcing and modularisation of production processes, the geographical shift of production and manufacturing operations to developing countries, and increased concentration in the control and coordination capabilities of lead firms in developed countries (Gereffi 1994; Dicken et al. 2001; Henderson et al. 2002; Coe et al. 2004; Hughes & Reimer 2004; Gereffi et al. 2005; Bair 2009). The contributions of these approaches to understanding contemporary economic globalisation have indeed been significant, as evidenced by prominent journals having published special issues around the themes of global value chains and global production networks and the more recent role that GVC approaches have played in international development policy agendas.[1]

In this chapter, I provide a brief review of the global value chain (GVC) and global production networks (GPN) approaches. Instead of seeing them as conflicting methods of analyzing contemporary economic globalization, I employ the most salient elements of each approach as methodological and investigative tools according to the main research objectives of this thesis ((1) to examine how e-

[1] Journals that have published special issues focussing on GVC and GPN approaches include: *IDS Bulletin* (2001); *Environment and Planning A* (2006); *Competition and Change* (2008); *Economy and Society* (2008); *Journal of Economic Geography* (2008); *International Journal of Technological Learning, Innovation and Development* (2009); *Global Networks* (2010); *Competition and Change* (2013); *Geoforum* (2013); and *Review of International Political Economy* (2014).

waste is revalorised and reintroduced into production network; (2) to identify the key actors in the regional e-waste production network in Malaysia and Singapore and analyse their relationships; (3) to assess the significance and role of informal labour (particularly *karung guni*) in the development and structure of the e-waste recycling network; and (4) to evaluate the impacts of a consideration of waste and informal labour on GVC/GPN approaches) to provide avenues to interrogate the different dimensions of production networks that illuminate the mechanisms, processes and politics practiced within the production network. Mechanisms refer to the underlying logic(s) that drive the e-waste recycling network to exist in the first instance, and second, to perpetuate. In this sense, I aim to uncover the economic and social impetuses that undergird the processes of revalorisation and reintroduction of waste into production networks. By processes I refer to the methods and strategies that enable the revalorisation of e-waste, and their subsequent reintroduction into production networks as raw materials. Finally, politics refers to the struggles, relationships and strategies practiced by actors in the regional e-waste production networks that are aimed toward achieving their individual objectives.

I echo Bair's (2009, p.14) opinion that the issue of which approach "to apply in a particular piece of research may well depend on the specific analytical or theoretical issue that is being addressed". Accordingly, I adopt a relatively conciliatory path between these two ways of analysing global patterns of production, distribution and consumption. In so doing, I echo Sturgeon's (2000, p.6) belief that a chain may be considered to be a partial "snapshot" of a more complex network. As such, in this chapter, I employ the term "chain/network"

when discussing attributes of these methodological tools that are broadly similar in both approaches. To this end, I argue that there are two key lacunae in the GVC and GPN approaches. First, there has been under-theorisation of waste, and the places, politics and practices surrounding *post*-consumption (see Dicken 2011; Herod et al. 2013; Herod et al. 2014). An analysis into post-consumption is important in shedding light on three issues: (1) an analysis of post-consumption illuminates the value (re)creation potentials and possibilities of commodities after they have been discarded and the processes that enable this revalorisation; (2) an examination of post-consumption sheds light on the actors, places and practices that enable the revalorisation of waste; and (3) a scrutiny of post-consumption activities elucidates the ways in which production networks are interlinked, through an understanding of how the waste of one network may be the raw materials for another. This oversight may be linked to the existing conceptualisation of GVCs and GPNs in a linear or network fashion that fails to conceptualise commodities that are considered waste as raw materials to be used in a fresh round of production once again and a tendency to focus on consumer goods (Bernstein & Campling 2006a). Hence, I argue that waste embodies value, and provides a means to investigate the linkages between different production networks. In addition, an examination of waste sheds light on the potential for value (re)creation in production networks. Second, there has been an under-treatment of labour (particularly informal labour) in GVC/GPN research, which has tended to place emphasis on transnational firms and states at various geographical scales as the main objects of analysis (see Smith et al. 2002; Barrientos & Kritzinger 2003; Selwyn 2010; Rainnie et al. 2013; Taylor et al. 2013 for similar critiques). Informal labour continues to be an important actor in contemporary

economies for two reasons: (1) in cities in 'developing' countries, informal workers account for as much as 45 percent of employment, while contributing as much as 60 percent to gross domestic product (Harriss-White & Gooptu 1998; Lerche 2007; UN ECLAC 2008; Breman 2010); and (2) informal workers are articulated in global production in multiple ways through their employment in manufacturing and services (Offe & Heinze 1992; Barrientos et al. 2003; Meagher 2010; McFarlane & Waibel 2012). In response to this under-treatment of informal labour, I argue that informal labour is a significant group of actors in globalized processes of production. I adopt the lens of petty commodity production to conceptualise the already existing articulations of this group in the regional e-waste recycling network in Malaysia and Singapore and their strategies to ensure social reproduction and survival (see Chapter 6). The lens of petty commodity production (as a form of production) is important to highlight the relations of production of *karung guni* who are always already articulated with the capitalist mode of production through their reliance on the formal sector for both their supply of their inputs ('raw' e-waste), and demand of their outputs (primary processed e-waste).

Value is the key overarching concept of analysis in this thesis, and is considered through the lens of Radical Political Economy (RPE). To this end, I adopt Marx's (1956; 1990) conceptualisation of value as a key conceptual lens in this thesis. Beyond just a descriptive category in this thesis, value is not conceived simply as a secondary object of conceptual and empirical analysis. Instead, value is the primary conceptual lens for the investigation of the relationships between and struggles among economic actors in the regional e-waste recycling network in

Malaysia and Singapore. This emphasis on value contributes to this thesis in three ways. First, a focus on value enables an examination of value creation, enhancement and capture in production networks, and forms the basis for an investigation of the flow and distribution of value in this production network (see Chapter 5). The e-waste circuit of value (Figure 5.1) which is discussed further in section 5.1, uncovers the creation and movement of value in the regional e-waste recycling network, and places emphasis on the importance of the labour process towards the creation, enhancement and capture of value. Second, this focus on value uncovers the value capture opportunities and capabilities of economic actors in this network that impact on the economic success and survival of these actors in the production network, in particular *karung guni* who are heavily reliant on the income from their collection and primary processing of e-waste to provide for their social reproduction and daily sustenance (see Chapter 6). In this sense, a focus on value elucidates the increasingly precarious social relations of production that *karung guni* are articulated in, as demonstrated by the unpredictable levels of revenue of *karung guni*. Third, a focus on value provides an avenue to investigate the various strategies that are employed by economic actors to increase their value creation, enhancement and capture potentials (see sections 5.5 and 6.3) which is directly linked to their aims of ensuring increasing profits (in the case of firms), and ensuring financial stability for daily survival (in the case of *karung guni*). To this end, the central focus on value is the key dynamic that links and integrates the arguments presented in this thesis. This thesis hence contributes to debates in GVC/GPN on the processes of value creation, enhancement and capture by placing value as the central concept of investigation.

Section 2.1 provides a brief overview of GVC and GPN approaches, and I argue that they should not be seen as opposing schools of thought. Instead, these two approaches may be employed effectively in tandem to analyze contemporary economic globalization. Indeed, Bair (2009, p.14) recognizes that there are several "scholars who have been influenced by, and whose present research references, more than one of these frameworks". This is followed by a discussion of five elements from these approaches that are most salient to this thesis: section 2.1.1 discusses the importance of understanding an input-output structure; section 2.1.2 considers the significance of chain governance and power; and section 2.1.3 discusses the concept of value, and argues that while it is a central concept in global value chains and global production networks approaches, value has been at best analyzed in a very limited way, in particular, concentrating specifically on the aspects of value capture, thus overlooking the people, places and processes surrounding value creation and enhancement. Section 2.1.4 argues that territoriality/territorial embeddedness is constitutive of the structure of production networks, and has significant impacts on the possibilities for value creation, enhancement and capture. In this sense, space is co-constitutive of the structure of production networks. Section 2.1.5 highlights the importance of understanding the institutional contexts within which production networks operate, and argues that nation-states play an important role in the structure and development of these networks.

Section 2.2 assesses the relative lacunae that this thesis seeks to address. Section 2.2.1 examines the role of waste in GVC/GPN studies, and I argue that an investigation into waste is a key avenue that has the potential to move GVC/GPN

research beyond its erstwhile concentration on three-staged analysis of production-distribution-consumption; section 2.2.2 evaluates the importance of labour, specifically informal labour, and argues that while scholars have been making headway in analyzing the articulations of labour within GVCs/GPNs, there continues to exist a gap in understanding the role of informal labour as significant constituents of GVCs/GPNs. Taken together, these two interventions serve to move present debates forward by first drawing attention to the importance of post-consumption activities that lead towards new rounds of production, thus contributing to debates about how different production networks are linked together. For example, Bair (2009, p.15) emphasised the importance of recognising that "the commodity chain is more like a web than a chain", thus establishing the need to attend to "the overlapping and intersecting nature of different commodity chains". And second, a focus on informal labour casts light on a group of actors that have been otherwise seen as "unproductive" (see Hart 1973; Breman 1976a; Gerry 1978; Moser 1978 for a critique of this), and highlights their integral role in the functioning of production networks, in particular in the regional e-waste recycling network in Malaysia and Singapore.

Section 2.3 discusses the research questions of the thesis, and the chapter concludes by arguing that the GVC and GPN approaches continue to be significant methodological and investigative tools to understand contemporary economic globalization, amidst the dynamic and ever-changing configurations and organization of global production. Nonetheless, a more expansive research agenda needs to be incorporated into these approaches, so as to account more effectively for the various processes, people and places that are articulated in patterns of

global production, distribution, consumption, and indeed, post-consumption. In summary, in this chapter I argue two points. First, I argue that GVC and GPN approaches are not irreconcilable with each other, but rather may be employed jointly in a research project to answer different research questions. Second, I argue that there exist two key lacunae in GVC/GPN research: (1) post-consumption and waste; and (2) informal labour. This thesis seeks to uncover the mechanisms and processes that enable the revalorisation of waste, and shed light on the people, politics and practices surrounding the creation, enhancement and capture of value that this revalorisation entails. In addition, this thesis aims to interrogate the strategies employed by economic actors (in particular *karung guni*) to ensure their social reproduction and survival.

## 2.1 GVC & GPN – Cut From The Same Stock?

Beginning around the mid 1980s with Hopkins and Wallerstein's (1986) analysis of commodity chains, the last two decades has witnessed a rapid growth in academic interest and research centred on examining 'the trajectory of a product from its conception and design, through production, retailing and final consumption' (Leslie & Reimer 1999, p.404). Indeed, scholars from disciplines including economic geography, development studies, business studies, international political economy and economic sociology have sought to interrogate the contemporary geographical and industrial (re)configuration of production (e.g. Gereffi & Korzeniewicz 1994; Henderson et al. 2002; Coe et al. 2004; Gereffi et al. 2005). These three approaches (global commodity chains, global value chains,

global production networks) have been adopted by a diverse range of social science disciplines due to their ability to provide an entry point to examine the complex intersections amongst the multiple interests of capital, labour and the state at various geographical scales and takes into consideration the dynamic and ever-changing global economic landscape (Smith 2014); what has otherwise been termed as 'actually occurring globalisation' (Neilson & Pritchard 2009, p.29).

It is not my purpose or intention to provide a systematic review of the GCC/GVC/GPN literature; this has been done to great effect elsewhere (Leslie & Reimer 1999; Smith et al. 2002; Coe et al. 2004; Bair 2005; Bernstein & Campling 2006a; Bernstein & Campling 2006b; Coe et al. 2008a; Bair 2009; Smith 2014). Rather, in this and the proceeding sections, I provide a brief overview of the GCC/GVC and GPN approaches, whilst highlighting the most salient points of each approach for this thesis.

The central concern of this broad field of research is the examination and analysis of the multiple ways in which configurations of global production are interconnected, controlled and coordinated, and structured over geographical space, and how value is created, enhanced and captured along the chain/network amongst its various actors. The linkages between the various actors in the chain/network are seen as sequences in an uneven market environment, representing the reality of power asymmetries that result in the unequal distribution of value along the chain/network. Within the GCC and GVC frameworks, the core to these analytical approaches has been the concept of governance: referring to the processes and practices through which lead firms in

chains seek to coordinate and control production through their upstream and downstream linkages with other economic and institutional actors. This was first conceived as binary governance types, with the object of analysis being the "lead firm" that exercises power over the other segments of the chain (Gereffi 1994). Governance in this sense is the framework that structures the relationships that exist amongst economic actors within any given chain/network. In his original approach, Gary Gereffi (1994) identified three central dimensions of global commodity chains: (1) An *input-output structure*, that describes the process of transforming raw materials and other inputs into final products; (2) a *territoriality*, or geographical configuration that analyses the dispersion and concentration of economic activities in particular geographical locations; and (3) a *governance* structure, which describes both the process by which particular players in the chain exercise control over other participants and how these lead firms (or chain drivers) capture or distribute the value that is created along the chain. In a subsequent publication, Gereffi (1995) added to this framework a fourth dimension: *institutional* context, which describes the 'rules of the game' that regulate the process and practices of firms in the chain, and thus structuring the organization and operation of the commodity chains themselves. Gereffi (1994) argued for the existence of a two-fold governance framework that distinguished between *producer-driven commodity chains* (often led and coordinated by large, upstream industrial firms, producing consumer durable products) and *buyer-driven commodity chains* (often led and coordinated by downstream firms, typically in consumer design, branding and retail, producing consumer non-durable products). This dichotomous governance framework was not without critics of its limitations, which included the inability to account for the dynamic

and ever-changing nature of inter-firm relations, while assuming that inter-firm relations between nodes in the chain were similarly governed throughout the chain, and were dominated by the "lead firm" (Fold 2002; Ponte & Gibbon 2005). In response to these criticisms, the initial governance framework was further articulated in Gereffi et al. (2005), where they expanded the framework from a two-fold framework, to a five-fold categorization of governance types, including a category that was labelled as hybrid or 'modular' variant. Significantly, the governance typology of Gereffi et al. (2005) differs from that of Gereffi (1994) insofar as Gereffi et al. (2005) seek to account only for the governance relationships of lead firms and their first tier suppliers. This is a shift from chain goverance as conceived by Gereffi (1994) which emphasised the ability of the lead firm to exercise power *over* the whole chain to an understanding of the lead firm exercising power *to* coordinate production.

The GCC/GVC approach as proposed by Gereffi and his collaborators has had a significant impact on the analysis of contemporary economic globalisation, in spite of being interjected over the years by an array of various competing methodologies, conceptual mazes and epistemological shifts, including systems of provision (Fine 2002), the filière approach (Raikes et al. 2000), the global production networks framework emerging out of the East-West Center (Ernst 2002; Ernst & Kim 2002), and the GPN approach from the "Manchester School" (Dicken et al. 2001; Henderson et al. 2002; Coe et al. 2004).

Notwithstanding the late entry of geographers into these debates (Dicken 2004), the precise contributions of economic geography to this dynamic theoretical field

have not always been evident. This has led to some scholars even suggesting that the "clutter of competing approaches has led to a certain degree of incoherence when it comes to articulating key insights" (Oro & Pritchard 2011, p.711; see also Neilson & Pritchard 2009). Significant efforts by several economic geographers have been undertaken in an effort to refocus research in the economic geographic line around a collective research agenda. Central to these efforts has been recognition of the importance of a "relational" approach (Yeung 2005). According to this "relational" perspective, production networks are defined in relation to their particular spatial environments through which actors and their actions are mediated. In other words, in contrast to previous frameworks that perceived production networks as processes that simply impact upon places, and are independent of their social and spatial contexts, the "relational" view argues that all economic actors are embedded within complex networks of multi-scalar territorial and socio-spatial relations (see Leslie & Reimer 1999; Hess 2004), thus influencing – in some cases constraining, in others expanding – the ability of these actors to act in various decision making processes (for example, in the way they invest globally, compete against imported goods, manage their workforce internally, etc.).

The work of a group of scholars termed by Harald Bathelt (2006) as the 'Manchester School' – a group of economic geographers that have a close affiliation with the University of Manchester – have been instrumental in the introduction and incorporation of the 'relational' perspective into economic geography, most obviously in their theorisation, conceptualisation and deployment of the GPN approach (Dicken et al. 2001; Henderson et al. 2002; Coe et al. 2004; Hess 2004;

Yeung 2005; Hess & Coe 2006; Hess & Yeung 2006; Coe et al. 2008a; Coe et al. 2008b; Coe et al. 2010). GPN scholars contend that GVC analysis has been dominated by research on issues of power and coordination, otherwise known as 'governance', in an epistemology that only considers uni-directional linear relationships and frameworks, or 'chains' (see Coe et al. 2004). According to the GPN approach, production networks are emphasised as operating within *multi-scalar* open economic and social contexts, as embodied by *extrafirm networks*, and are characterised as being *dynamic* through a series of feedback loops. The characteristics of the economic and institutional actors are pivotal in shaping the structure of relationships within their production network and with other actors in associated production networks *across geographical space and scales*. Over time, these dynamic relationships are moulded, re-negotiated and adjusted to meet changes in the contemporary economy, and thus alter the initial conditions that enabled the relationships at the onset. These changes in the behaviour and strategies of the various economic and institutional actors over time are recognition of the dynamic nature of GPNs. A key means through which regions are able to engage in processes of regional development would be through being articulated with the production demands of transnational corporations through the processes of *strategic coupling* which is defined as "a mutually dependent and constitutive process involving shared interests and cooperation between two or more groups of actors who otherwise might not act in tandem for a common strategic objective" (Yeung 2009a, p. 332; see also Yang 2009; Yang & Coe 2009; Yeung 2009b; MacKinnon 2011).

**Table 2.1: Similarities and Differences of GCC, GVC and GPN Approaches**

| Category | Global Commodity Chains | Global Value Chains | Global Production Networks |
|---|---|---|---|
| **Main Disciplinary Affiliation** | Economic Sociology / Organisational Sociology / Development Studies | Economic Sociology / International Business Studies / Industrial Economics | Economic Geography (Also by *Capturing the Gains* which is an interdisciplinary international research network that includes Gary Gereffi and Stephanie Barrientos) |
| **Definition of Chain / Network** | A commodity chain refers to "a network of labor and production processes whose end result is a finished commodity" (Hopkins & Wallerstein 1986, p.159)<br><br>A global commodity chain is made up of "sets of interorganizational networks clustered around one commodity or product, linking households, enterpreises, and states to one another within the world-economy. These networks are situationally specific, socially constructed, and locally integrated, underscoring the social embeddedness of economic organization." (Gereffi & Korzeniewicz 1994, p.2) | A value-added chain refers to "the process by which technology is combined with material and labor inputs, and the processed inputs are assembled, marketed, and distributed. A single firm may consist of only one link in this process, or it may be extensively vertically integrated" (Gereffi et al. 2005, p.79) | "A GPN can thus be broadly defined as the globally organized nexus of interconnected functions and operations of firms and nonfirm institutions through which goods and services are produced, distributed and consumed." (Coe 2009, p.557) |
| **Object of Inquiry** | Interfirm chains in global industries | Interfirm linkages (in particular, lead firms and first-tier suppliers) | Transnational network configurations of firms, emphasising on regional development |
| **Conceptual Formulation** | Linear; Chain-oriented | Linear; Chain-oriented | Broad relational framework; Network-oriented |

| | | | |
|---|---|---|---|
| **Guiding Concepts** | Input-output structure<br>Governance<br>Territoriality<br>Institutional Context | Value-adding chains<br>Typology of governance<br>Organizational learning<br>Industrial upgrading | Value creation, enhancement and capture<br>Corporate, collective and institutional power<br>Societal, network and territorial embeddedness<br>Strategic coupling |
| **Significant Publications** | Hopkins & Wallerstein (1986); Gereffi (1994); Gereffi & Korzeniewicz (1994); Gereffi et al. (1994); Gereffi (1995); Selwyn (2012) | Dolan (2000); Schmitz (2000); Kaplinsky (2000); Gereffi & Kaplinsky (2001); Humphrey & Schmitz (2001); Sturgeon (2002); Barrientos et al. (2003); Gereffi et al. (2005); Cattaneo et al. (2010) | Dicken et al. (2001); Henderson et al. (2002); Coe et al. (2004); Hess (2004); Hess & Coe (2006); Bridge (2008) |
| **Key Arguments / Focus** | Historical Contexts of Chains; Governance of Chain; Sequential movement down a chain; Core-periphery relations | Inter-Firm Linkages; Governance forms between lead firms and first-tier suppliers; Sequential movement down a chain | Complex interplay between multiple stakeholders; No definite starting point; Permits multiple entry points for research; Multi-scalar; Multi-actor; Multi-directional; Strategic coupling and territorial development |
| **Significant Reviews of Literature** | Leslie & Reimer (1999); Hughes & Reimer (2004) | Bair (2005); Bair (2009) | Hess & Yeung (2006); Coe et al. (2008a); Coe (2012); Neilson et al. (2014) |
| **Significant Critiques of Literature** | Dicken et al (2001); Fine (2002); Smith et al. (2002); Starosta (2010a) | Ponte & Gibbon (2005); Gibbon & Ponte (2008); Gibbon et al. (2008); Starosta (2010b) | Levy (2008); Herod et al. (2014); Smith (2014); Smith et al. (2014) |
| **Intellectual Roots** | World-systems theory / Monopoly capital theory | Global commodity chains / Transaction cost economics | Relational economic geography; Actor-network theory; Global value chains; Varieties of capitalism |

In addition, the ability of firms and regions to capture value would be determined by the different levels of *embeddedness* (Hess 2004; Coe & Lee 2006; Liu & Dicken 2006). Augmenting the concept of governance as espoused by GVC scholars, GPN researchers argue that governance is *temporally and spatially contingent* and is thus complex, contingent and variable over time. Table 2.1 presents the similarities and differences amongst the three approaches as adapted from various sources.

While several scholars – including the 'Manchester School' – have been drawing clear disciplinary lines differentiating the GVC approach from the GPN approach, in this thesis I argue that these two approaches are in no way contradictory to each other, but rather, can be deployed to answer different sets of questions more effectively than if deployed independently, due to their different emphases. Sturgeon (2000, p.6) has argued that the differences between 'chains' and 'networks' are simply based on the level of abstraction and the scale of analysis that one adopts, suggesting that a value chain can "be used to denote a particular, product-based thread of activity that, at a given moment in time, runs through a larger constellation of activities and dynamic configurations embodied in a production network. A value chain can be thought of as a sub-set of a production network, a simplified snapshot taken within the much more complex and dynamic set of activities encompassed by the network" (see also Bair 2005; Bair 2009).

Reiterating his stand, Sturgeon contends that:

> global commodity chains, global value chains and global production networks… [share] a focus on the organizational and spatial structure and dynamics of industries, the strategies and behaviour of major firms and their suppliers, and the need to identify scalable conceptual tools that help researchers move easily from local to the global level of analysis. These commonalities, in my view, define a core research agenda that cuts across these chain and network paradigms (Sturgeon 2009, p.127; see also Sturgeon et al. 2008; Challies 2008).

In my opinion, the applied research carried out by GPN researchers and GCC/GVC scholars have been very similar. This view echoes the assessment of Jennifer Bair (2008, p.356) who stated that:

> Despite the concerted efforts of its proponents to distinguish the GPN framework from the GCC approach, the research carried out under the banner of the former does not differ greatly from studies of global commodity chains, particularly in terms of methodology. For the most part, both literatures consist primarily of empirically rich case studies analysing trade and production networks in global industries.

In a similar way, Guido Starosta (2010a, pp.433-434) sees the GVC and GPN approaches as sharing many similar attributes: "[w]ithout wanting to downplay the differences between the varied intellectual traditions in this broad group of perspectives, they all share a common set of assumptions and concerns."

Starosta (2010a) lists these similarities as first, a focus on the phenomena associated with economic globalisation, marked by the "emergence of a pattern of global dispersion with functional integration of economic activities"; and second, the emphasis on firms, in particular lead firms, as "fundamental drivers of these

economic transformations", thus serving as a focal point of efforts at theorising economic development.

Emerging from this recognition of the different contributions of GVC/GCC and GPN work, in the following sections, I highlight the investigative tools that are of greatest relevance to this thesis, namely: (1) Input-Output Structure; (2) Chain Governance; (3) Value; (4) Territoriality/Territorial Embeddedness; and (5) Institutional Context. For each of these concepts, I argue that their conceptual purchase is unique and significant toward the understanding of the regional e-waste recycling network in Malaysia and Singapore by contributing to: (1) an interrogation of the mechanisms and processes in the network; (2) an examination the ways in which the network is structured; and (3) an analysis of how value is created, enhanced and captured by the actors involved.

### 2.1.1 Input-Output Structure

At the core of the commodity chain approach is the idea that the process through which a commodity is produced, from its initial conception in R&D laboratories or other creative centres, to its final use by consumers can be conceived as being made up of a number of sequential activities that are linked in a chain (i.e. the input-output structure). It is assumed that as a product passes from one node to another, it increases in value, up until the point of final consumption (Gereffi et al. 2005). From an organisational perspective, the central idea of this chain is the segmentation and separation of discrete activities, and each of these functions, although independent, is connected, and as such, interdependent.

These isolated interdependent operations (more specific processes) are labelled as 'nodes'. The GVC approach thus places emphasis on four key elements: (1) investigation into the actors (particularly lead firms) and processes in shaping the organizational and territorial structures of individual nodes within the entire production chain, (2) tracing the linkages (otherwise known as 'linkages and flows') between nodes, (3) evaluating how these are moulded and manipulated by various economic and institutional actors, and (4) exploring the implications for the various individual nodes and actors brought about by actions and activities of other actors in the production chain.

Several studies have documented the participation of different economic and institutional actors in production chains. These include studies into the role of the state and international bodies (Bair & Gereffi 2003; Gellert 2003; Bair 2006; Bair & Peters 2006; Smith 2014), firms (Fold 2002; Hassler 2003; Tokatli 2007; Pietrobelli & Saliola 2008; Saliola & Zanfei 2009; Hughes et al. 2013), NGOs (Jackson et al. 2006; Riisgaard 2009; Riisgaard & Hammer 2011) and labour (Barrientos & Kritzinger 2003; Bernstein 2004; Dolan 2004; Knorringa & Pegler 2006; Anner 2007; Palpacuer 2008; Selwyn 2010a; Barrientos et al. 2011; Selwyn 2012). The role of (lead) firms has been the main focus of chain analysis, with most research focussing on upgrading, value, governance and knowledge transfer (Gereffi 1999; Gibbon 2001; Humphrey & Schmitz 2001; Humphrey & Schmitz 2002; Palpacuer 2008; Tran et al. 2013).

The analysis of the input-output structure in the regional e-waste recycling network in Malaysia and Singapore has three important dimensions. First, it enables the identification of economic and institutional actors in the regional e-waste recycling network in Malaysia and Singapore. This 'mapping' of the social and spatial connections between/amongst the various actors is the first step in unpacking the complex relationships amongst network actors, especially in deciphering how power and value are distributed within the network. Second, the study of the input-output structure allows for the examination of the geographical and spatial movement of the materials across national boundaries, and is key to understanding the role of the state and international conventions and regulations – the Basel Convention in particular – that govern the trans-boundary movement of materials. Third, the input-output structure enables an understanding of how e-waste, through recycling, and the labour process, can be put through further rounds of value creation and enhancement, and be returned to the production network either as a raw material for re-manufacture, or as an item that can be placed on the re-use market.

### 2.1.2 Chain Governance

GVCs consist of a heterogeneous group of firms and non-firm actors that drive the organisation of value chains, and take into account the ever-increasing diversity, complexity and dynamics of industrial organisation, the global division of labour, and the uneven geographies of production and consumption. Importantly, the GVC approach takes into account how upward and downward linkages and transactions are structured. In light of these various issues, governance has

emerged as a key concept to interrogate the exercise of control and coordination within any given chain. An understanding of the role of governance is key as it determines how and on what terms firms participate in the global division of labour, and their capacity for value capture. More importantly, chain governance also illuminates the capacity of actors in the chain to exercise power over other actors both upstream and downstream in a chain (Gereffi, 1994). According to Gereffi (1994, p.97), the governance structure of a global commodity chain is defined as the "authority and power relationships that determine how financial, material, and human resources are allocated and flow within a chain".

Over the course of the past two decades, more sophisticated typologies of governance have been formulated and put forward in an effort to improve on previous approaches. In his initial contribution, Gary Gereffi (1994) attended to the question of 'who governs' and thus laid emphasis on the dominant actors within a chain, in particular lead firms. This vein of literature saw the emergence of a distinction between 'buyer-driven commodity chains (BDCCs)' and 'producer-driven commodity chains (PDCCs)'.

Gereffi, Humphrey and Sturgeon (2005) further developed this definition of governance structures into a taxonomy of five ideal forms of governance: Market, Modular, Relational, Captive and Hierarchical (see Dolan & Humphrey 2000; Schmitz & Knorringa 2000; Humphrey & Schmitz 2001; Humphrey & Schmitz 2002; Sturgeon 2002). Emerging out of an analysis of governance, Gibbon et al. (2008) have categorized research into governance in GVCs into three distinct camps: governance as *driving*; governance as *coordination*; and governance as

*normalization*. The capacity to affect other actors, to shape their actions, and to control their activities, is distributed unevenly along a chain, often with 'lead firms' taking on functions of command and control. By assuming strategic roles and positions within a chain, 'lead firms' – which often exert critical governing power within a chain – can diminish transaction costs, enhance their capacity to raise the barriers to entry, and increase their own economic returns.

Whole chains are usually not defined by a singular form of governance, but are rather a mixture of various ideal forms of governance, as Sturgeon (2009, p.124) argued:

> Any value chain, …, contains thousands, if not millions, of individual transactions, …, Just as chains are composed of multiple linkages, so too can they contain multiple governance forms. In other words, characterizing larger amalgams of transactions according to one of the five ideal GVC governance types requires an assumption that all linkages within a chain or industry have the same character. Such value chains do not exist in the real world.

Citing Talbot (2009), Bair also concludes that multiple forms of governance can and do co-exist at different stages within a single commodity chain, and have the potential to create conflicts and opportunities for expansion and growth amongst the various actors in a chain (see also Sturgeon 2001; Fold 2002; Gibbon 2003). Here it is important to acknowledge Ponte & Gibbon's (2005) differentiation between co-ordination in a chain and chain governance. Ponte & Gibbon (2005, p.22) argue that "forms of co-ordination, however, should be kept distinct from modes of governance. A global value chain may be characterised by different forms of co-ordination in various segments, yet a relatively coherent mode of

governance". In this sense, they argue that "[t]he distinction between buyer-driven and producer-driven chains then remains a useful device for the analysis of governance… irrespectively of what the *forms of co-ordination* are between individual segments of a value chain" (Ponte & Gibbon 2005, p.22; emphasis mine). Importantly, the distinction between modes of governance and forms of co-ordination sheds light on the distribution of power in chains, and draws attention to the nature of value chains which consist of "a single and relatively coherent mode of overall governance" and "different forms of co-ordination that vary both along and between value chains" (Ponte & Gibbon 2005, p. 3).

Since the publication of the new typology, the governance concept has continued to receive the most academic attention compared to the other components of the GVC approach. Much work has been done linking governance, for example, with development (see Daviron & Ponte 2005; Palpacuer et al. 2005;Dossani & Kenney 2007; Razmi & Blecker 2008); and technology transfer (see Schmitz 2006; Morrison et al. 2008; Sturgeon et al. 2008; Ivarsson & Alvstam 2009; Ivarsson & Alvstam 2011; Ivarsson & Alvstam 2013). In addition, governance has been discussed in relation to setting standards (Humphrey & Schmitz 2002; Gibbon 2008), and as discussed in Chapter 5, the establishment of industry standards is another example of governance as *coordination* that allows for globalised e-waste recycling firms to fulfil the requirements of a range of OEMs and OBMs.

Echoing Sturgeon (2001; 2002), I argue that lead firms (i.e. electronic and electrical products OBMs) in the regional e-waste employ "governance as control"

as their main strategy to govern the regional e-waste recycling network in Malaysia and Singapore.

Nonetheless, Gereffi et al.'s (2005) typology – which was informed by Sturgeon's concept of modular value chains (Gibbon & Ponte 2008, p.322) – has limited purchase in this regard, due to the central role played by the informal economy, and the nature of the goods being produced and traded (that of waste – much different from the consumer products industries that Gereffi et al. (2005) set out to investigate), and consequently I argue for a consideration of governance beyond just lead firms and first-tier suppliers. Even so, the typology provides an initial entry point to understand the processes and politics surrounding the exercise of power and governance in the regional e-waste recycling network in Malaysia and Singapore by shedding light on the social relations of control that exist within the network, and illuminates the practices of governance therein.

### 2.1.3 Value

The concept of value is relatively under-researched in GVC scholarship and indeed also in GPN research (Smith et al. 2002; Starosta 2010a; Starosta 2010b). In situations where value is discussed, it is often in relation to value capture, and how this may contribute towards industrial upgrading or regional development (Bair & Gereffi 2003; Giuliani et al. 2005; Murphy & Schindler 2010; Rossi 2013). As Elson has argued, "the *object* of Marx's theory of value was labour", thus a more fruitful engagement with the labour theory of value sheds light on the under-treated integral role of labour in production processes (1979, p.123; see also Elson 1998;

Kay 1979). Critiquing the initial GCC formulation, Smith et al. (2002, p.43) argued that "the focus on the commodity *per se* can be further developed towards an understanding that commodities embody value and it is the relations of value across space that enable us to unpick the reconfiguration of the territorial organization of economic activity in macro-regional economies."

In their assessment of GVC scholarship, Gibbon et al. (2008) similarly observe a lack of engagement with concepts of value. Gibbon et al. (2008, p.332) argue:

> What happened to 'value'? The trend toward a re-configuration of GVC analysis in terms of mainstream economics or some version of economic sociology has had the apparent side effect of moving practitioners' interest away from discussions of 'value' (a topic that an innocent observer might assume should lie at the heart of theories of global value chains).

Gibbon et al. (2008, p.332) contend that there are two main issues surrounding value in GVCs: "first, how and by what processes value is *created*; and, second, how and by what processes the resulting value is *distributed*". Closely related to value distribution would be value *capture* that has been the main focus of the GPN approach (Coe et al. 2004; Johns 2006). Accordingly, Gibbon et al. (2008, p.331) argue that "the first of these components [i.e. value *creation*] has hardly been discussed at any stage of the development of GVC analysis" and the "second [i.e. value *distribution* and *capture*] was touched on frequently from the mid-1990s onward, initially almost exclusively in terms of the shares of final prices associated with different links in given chains… but was not subject to an attempt at theorization until around 2000-1".

In contrast to GCC/GVC research, GPN scholarship sought to bring two different theories of value together in their approach. Henderson et al. (2002, p.448) in setting out the GPN approach argued that "by 'value' we mean *both* Marxian notions of surplus value and more orthodox ones associated with economic rent".

Linked to the emphasis in GVC and GPN scholarship on value capture has been an oversight as to the inner-workings of the firm, thus obfuscating the possibly conflicting and cooperative social relations of production that occur within the firm amongst labour that is increasingly conceptualised as differentiated and myriad 'sentient beings' rather than simply being another factor of production (Coe et al. 2008a). Accordingly, an investigation into labour and the social relations of production in production networks would reveal the significant and constitutive role of labour in the processes of value creation and enhancement through the labour process (see Chapter 5). To this end, I argue that there needs to be a clearer engagement with a labour theory of value in GVC/GPN approaches, echoing Coe (2012, p.394) who argued that GCC/GVC/GPN approaches are "inherently empiricist and overly concerned with meso- and micro- levels of inquiry" (see also Starosta 2010a; Starosta 2010b). Indeed, the adoption of a Marxian circuit of capital in GVC/GPN studies provides a macro-level analysis of the social relations of production, and proffers a means of examining production networks within circuits of capital (see section 5.1). To this end, this thesis is informed by a Marxian circuit of capital to make sense of the dynamics and social relations of production in the regional e-waste recycling network in Malaysia and Singapore. In addition, in Chapter 6, I critically appraise the informal economy – in particular informal

labour (i.e. *karung guni*) – as constitutive of the regional e-waste production network in Malaysia and Singapore through the lens of petty commodity production.

### 2.1.4 Territoriality / Territorial Embeddedness

According to the GVC approach, the territoriality of a value chain describes the spatial concentration or dispersion of economic activities in the chain (Gereffi 1994). Gereffi's (1994) descriptive approach to understanding the organisation of global production neglects the importance of a "spatially-sensitized rendition" of the structuring of global patterns of economic activity (Neilson & Pritchard 2009, p.30). Instead, in this section I argue that an attention to the co-constitutive role of space is critical to understanding the development and structure of production networks (see Dicken et al. 2001; Henderson et al. 2002; Coe et al. 2004). Critiquing the neglect of space in the GVC approach, Fold (2008, p.98; see also Kelly 2013) argued that:

> territoriality is treated at a highly aggregated level in the GVC approach, and that space is far better incorporated in the Global Production Network (GPN) approach in which actors shaping global (production network) dynamics are anchored in different places and multiple scales, thereby creating an explicit analytical link between a particular GPN and (subnational) regional development.

In contrast to the GVC approach that "remained relatively 'placeless'" (Rainnie et al. 2011, p.158; see also Smith et al. 2002; Bair 2008), the GPN approach

emphasises the constitutive role of territorial embeddedness in shaping the structures of production networks, arguing that:

> an understanding of the 'territoriality' of production networks – namely, how they constitute and are re-constituted by the economic, social and political arrangements of the places they inhabit – is central to an analysis of the prospects for development at the local level (Henderson et al. 2002; see also Hess 2004; Coe et al. 2004; Hess & Coe 2006; Yeung 2009a).

In this sense, the GVC approach takes a more descriptive approach to spatiality, as opposed to the GPN approach that conceptualises locations, places and regions as co-constitutive of the politics and processes of strategic coupling that lead towards regional development (Yang 2009; Wei & Liao 2013; Yeung 2014). Thus, I argue that place-specific characteristics are constitutive of production networks and this underscores the importance of employing place-specific analyses in understanding the value creation, enhancement and capture possibilities of actors and regions in production networks.

Territorial embeddedness is significant to understanding the regional e-waste recycling network in Malaysia and Singapore in two distinct ways. First, the different socio-political situations in Malaysia and Singapore affect the practices of recycling in the two countries (see Sections 4.3.2 and 5.3). By regulating (or not) the waste industries and the activities of *karung guni*, the different socio-political regimes in Malaysia and Singapore impact the possibilities for value (re)creation through their geographically particular restrictions and opportunities on recycling activities. In addition, recognising the distinctive territoriality of production

networks echoes the argument of Neilson and Pritchard (2009, p.9) who contend that territorially embedded "institutional formations and governance arrangements coexist in an iterative nexus within global value chains". Second, the different policies of governments towards social policy affect the social reproduction capabilities of *karung guni*. In this sense, the legislative environment regulating the informal economy have a direct influence on the livelihoods of informal labour. An emphasis on the ways in which "economic activities become anchored in particular places" (Kelly 2013, p.84) sheds light on the importance of geographical specificity to the articulations of economic activities at various geographical scales.

Related to the dimension of territoriality is the importance of spatiality in impacting the value creation possibilities of *karung guni*. Sections 5.3 and 6.3.7 highlight the importance of different spatial arrangements in value creation opportunities for *karung guni* in Malaysia and Singapore. In this sense, location-specific attributes have the effect of potentially constraining or enabling the creation, enhancement and capture of value by actors in production networks.

### 2.1.5 Institutional Context

Closely related to the dimension of territoriality in Gereffi's (1994) GCC approach is that of institutional context that analyses the role and significance of

governments at various geographical scales in influencing the ways in which global production is configured. Gereffi (1995, p.113) defined the "institutional framework" dimension as "how local, national, and international conditions and policies shape the globalization process at each stage of the chain". Reflecting on the commodity chain approach, Immanuel Wallerstein (2009, p.83) opined that "[a]ll chains are… subject to interference by state authorities, because states have the sovereign rights within the interstate system to establish rules about what crosses their frontiers". In this sense, it is crucial to attend to "the various ways in which governments shape… the institutional context within which chains operate" (Bair 2009, p.19).

Despite the large body of GVC research, the institutional dimension has received the least attention among the four dimensions, which led Hess and Yeung (2006, p.1196) to argue that "the institutional dimensions of the GCC/GVC analysis seem to be hijacked by its privileging of governance structures". Critiquing Gereffi's (1995) institutional framework dimension, Thomsen (2007, p.757) suggested that Gereffi had 'provided little indication of the exact meaning of this term".

Nonetheless, several scholars have sought to underscore the pivotal role of the state in influencing the geographies of global production (Talbot 1997; Gereffi & Bair 1998; Stevens 2001; Ponte 2002; Palpacuer et al. 2005; Bair & Peters 2006; Glassman 2011). Through what Bair (2005, p. 168) calls "regulatory mechanisms", the state can be highly influential in creating opportunities or constraining the

ability of economic actors to create, enhance and capture value through its domestic and foreign trade policies. In his analysis of the Indonesian state, Gellert (2003) argued that the Indonesian government played a pivotal role in propelling Indonesian plywood and timber export producers to dominate the Japanese market through an alliance between an oligopoly of plywood producers and the Indonesian state. Through this alliance, and another between Indonesian and Japanese 'private' capital brokered by the Indonesian government, Indonesian timber producers were able to play a key role in the production and control of the processed plywood market in Japan from 1985 to 1988. Underscoring the importance of state policy to the structure of production networks, Rammohan and Sundaresan (2003), in their analysis of the coir yarn spinning industry in Southern India, found that the policies of the two state governments of Kerala and Tamil Nadu were highly influential in creating differing structures in coir yarn production. In addition, Neilson and Pritchard, in their examination of tea plantation districts in Southern India, assert that the role of institutions is pivotal to governance of a chain, contending: "the institutional dimension of chains is insinuated within their very core" (2009, p.56). Echoing Neilson and Pritchard (2009), I argue that institutions, in particular governments at various geographical scales, are co-constitutive of the development and structure of global production through their ability to enact policies and legislation that may at the same time enable and constrain the potential of actors in their territorial regions to create, enhance and capture value.

The institutional context within which global production is organised is important

to this thesis because it highlights the significance (or not) of institutions at two geographical scales. At the global scale, the Basel Convention on the Transboundary Movement of Hazardous Waste monitors and enforces restrictions on the global trade in e-waste among its member countries who have ratified and put into force the legal framework of the Convention (or not, as will be argued in section 4.3). In this way, global institutions such as the UNEP influence the global patterns and organisation of e-waste management. At the national scale, the analysis of the regional e-waste recycling network in Malaysia and Singapore straddles the institutional contexts of two national governments, and thus presents an opportunity for comparisons to be drawn (where applicable) on the significance of government policy in influencing the development and structure of the e-waste recycling network in each territory.

In this section, I began by arguing that the GVC and GPN approaches are methodological and investigative tools that can be employed in tandem in a research project to answer different types of research question to great effect. Following this, I discussed five salient elements drawn from GVC and GPN approaches (i.e. (1) input-output structure; (2) chain governance; (3) value; (4) territoriality/territorial embeddedness; and (5) institutional context), and argued that these elements are pivotal in the analysis of the regional e-waste recycling network in Malaysia and Singapore. In the next section, I present the two main lacunae that this thesis aims to address: (1) waste; and (2) informal labour. First, I look at the relatively neglected back-end of networks, through an analysis of the role of waste. Importantly, an examination of waste sheds light on the potential

opportunities for the (re)creation of value in discarded commodities by conceptualising waste as 'raw materials' for further rounds of production. Second, I unpack the literature on labour within GVC/GPN research, and argue that there has been a distinct lack of engagement with a significant portion of the economy that is categorised as "informal". Coe et al. (2008a, p.286) have argued that "there is a potentially analytically and politically rich line of enquiry that can, … , serve to reveal the active and constituent role of workers within the value dynamics of GPNs". In the case of the regional e-waste recycling network in Malaysia and Singapore, informal labour is integral to the production network as they are the key actors involved in the collection, dismantling and sorting of e-waste. Indeed, informal labour are often engaged in activities that the formal economy is unwilling to perform, and hence informal labour are key actors in contemporary economic production. To this end, this thesis addresses these two lacunae through an empirical investigation of the regional e-waste recycling network in Malaysia and Singapore, and an interrogation of the articulations of informal labour – in particular *karung guni* – through the lens of petty commodity production.

## 2.2 What's Missing? – Waste and Labour

Until recently there has been relatively little regard for (1) waste and the accompanying recycling industries (Crang et al. 2013; Herod et al. 2013; Herod et al. 2014; Pickren 2014a) , and for (2) the constitutive role of labour (Selwyn 2012; Coe 2013; Coe & Hess 2013; Rainnie et al. 2013; Taylor et al. 2013), particularly labour in the informal economy (Phillips 2011), in shaping production networks.

An investigation into waste sheds light on the processes and politics surrounding value (re)creation in production networks, while an interrogation of the role of informal labour – in addition to considering an otherwise overlooked group of actors in GVC/GPN approaches – highlights the constitutive and pivotal role of informal labour in regional e-waste recycling networks in Malaysia and Singapore. In this section, I highlight the relative silence over issues concerning waste and labour in the informal economy that exists in the GVC/GPN literature. An analysis of waste enables new insights into the processes and possibilities of value (re)creation in production networks, and also provides an avenue for advancing the GVC/GPN approaches to take into better consideration processes beyond the present emphasis on the points of production – distribution – consumption, as suggested by Dicken (2011) and Coe (2012). The significance of investigating the role of workers in the informal economy underscores the constitutive role of informal labour in the regional e-waste recycling network in Malaysia and Singapore through their collection, dismantling and sorting of e-waste that is otherwise not undertaken by formal e-waste recycling firms. Moreover, an implication of this scrutiny of informal labour is the provision of a deeper understanding of the role of labour in production networks, and thus advances the agenda of recognising the diverse articulations of labour with production networks.

### 2.2.1 Waste

At present, GPNs have been operationalized to understand the processes of production, distribution and consumption, with more empirical and theoretical

emphasis placed on the first two processes. However, to view consumption as the end point of a GPN signals a premature end to the potential contributions of the GPN framework. Indeed, Bair (2009, p.15) reminds us that 'what may be the last link in one chain is itself an input or intermediate link to another'. She emphasizes how we must still continue tracing the commodity chain, even after the final product is consumed. This is for two reasons. First, it brings to completion what might otherwise be thought of as an incomplete commodity chain by bringing the end products (after consumption) back into the productive realm as 'raw materials'. Second, through the process of recycling, what is deemed 'worthless' and is therefore disposed, is found to embody value once again through the labour process. Rather than being beholden to this limitation, the by-products of consumption (generally thought of as waste by many) can form the beginnings of another GPN – one that is focussed on the provision of urban waste collection and the recycling services industry. Indeed, there has been increasing recent recognition of the role of waste in the global economy. Recent forays into the emerging 'geographies of waste' include work by Ray Hudson (2008a; 2008b), Mike Crang (2010; 2013), Lucy Norris (2005; 2008; 2010), Nicky Gregson (2007; 2009; 2010; 2013), Graham Pickren (2014a; 2014b), Andrew Brooks (2011; 2012; 2013) and Josh Lepawsky (2010; 2011; 2012a; 2012b; 2014). A concern with waste and recycling can also be traced back to the work of Matthew Gandy (1993; 1994). The Green Movement across the world has sought to bring new life and purpose to what would otherwise be termed 'waste' through efforts and actions promoting recycling and re-use of materials. The ability to integrate a GPN perspective in understanding the recycling industry is fruitful not only because it incorporates a view towards commodities and resources beyond consumption; but

also because through the analysis of the (re)generation of value in waste, discarded and disposed materials can be conceptualised as the beginning of a new production network or commodity chain (Hudson 2008a; Herod et al. 2013; Herod et al. 2014; Pickren 2014a; Pickren 2014b).

In order to think about 'waste', we need to begin first at the point at which a product becomes 'waste'. Waste is created at two main junctures in processes of production-consumption, most prominently during production, where waste products are produced as a by-product of the main product. Take, for example, the production of iron from iron ore, which results in the production of a significant volume of slag, its by-product. The second juncture, and of most importance to this research, is waste that is created *post-consumption*. Waste is indeed that matter that has been discarded by those who see no more value in it or have no organised commercial interest in it. This does not mean that the object has truly lost all of its value (see Herod et al. 2013; Herod et al. 2014). Rather, waste and other discarded objects still contain 'latent' value, which is realised when individuals and firms seek to recycle and reuse materials that have been previously discarded. From this view therefore, certain types of waste are never truly 'waste', but rather are raw materials that contain unrealised value (see Chapter 5).

Yet, what is waste exactly? The meanings and definitions of 'waste' have gone through many changes, and indeed have been indicative not only of the 'waste' itself, but also of the people who work in the waste industries (see Cooper 2008; Cooper 2009; Cooper 2010). According to the 1989 Basel Convention, waste may be defined as "substance or objects which are disposed or are intended to be

disposed or are required to be disposed of by the provisions of national laws". This definition embodies the everyday understanding of waste as matter to be discarded, or to be 'put in its proper place' (see Douglas 1966). However, there is a need to see beyond this broad definition, both practically and conceptually, and this challenge poses two key issues.

First, the very definition of waste, or what constitutes and is classified as waste, is varied and contested across space and time (Whitson 2011; Moore 2012). 'Waste' can be separated according to its point of origin, including nuclear waste, industrial sewage, mining spoil and household refuse; or in relation to its composition, or its methods of collection and management, or the level of toxicity or hazardousness. This plethora of means of distinguishing between what is and is not waste creates problems not only in the measure of waste, but also in the effective management of its disposal, either in terms of recycle/reuse or incineration/landfill. Indeed, whether an item falls into the category of 'waste' inevitably varies, as does the reliability of those categories and groups, thus reflecting the spectrum of collection, treatment and disposal paths that waste materials can encounter. For example, the United Nations Environment Programme (2004b, p.6) defines waste as "materials that are not prime products (that is, products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and which he/she wants to dispose". Scholars too disagree on what is or is not 'waste'. Gille (2010, p.1050) states that waste is "any material we have failed to use". Adding a temporal dimension to the definition of waste, Boyle states that waste refers to "materials that are residual to the needs of the individual,

household or organization at a particular time and thus need to be disposed of" (2001, p.73; see also Boyle 2002). Hence, it is extremely challenging to compare waste production and management across different territories, or to gain any reliable overall measure of the volume of global waste production. The differences in definition of waste present challenges in this thesis, as it prevented a comparative analysis of e-waste production and management in Malaysia and Singapore (for example, the different definitions of e-waste by Malaysia and Singapore prevented an analysis of the volumes of e-waste traded between these two countries as reported to the Secretariat of the Basel Convention), and also made it challenging to map the flows of e-waste globally since sending and receiving countries would have dissimilar volumes of traded e-waste reported (see Section 3.0).

Second, the very definition of waste as matter that needs to be disposed of immediately exemplifies the temporal and spatial specificity for categorising any form of matter as waste. The vast majority of materials that are classified as waste can remain raw materials, if only they were in a different social or cultural context and a different temporality, or in the right place at the right time (and perhaps the right price too). Similar to social objects that pass through continual valuation and re-valuation when circulating amongst different "regimes of value" (Appadurai 1988; Thomas 1991; Myers 2001), so too can 'waste' be reassessed in its value in spite of being discarded. Understood this way, an object thus becomes defined as 'waste' when it crosses the socially and culturally contingent boundary where the apparent value of the object is less than the apparent costs of retaining it. Thus, 'waste' becomes the "objective co-relative" of value (Alexander 2006, p.456), and

"is the degree zero of value, or it is the opposite of value, or it is whatever stands in excess of value systems grounded in use" (Frow 2003, p.25). For instance, a wood product manufacturer might be able to recognise the potential economic value in the wood waste that is generated, but yet fail to make use of this due to his/her inability to find an economically viable market for raw materials. Hence, the wood waste remains as waste to the manufacturer, but would otherwise not be that if s/he were able to find a productive means of (re-)manufacturing it into economically marketable products. Indeed, the ways in which objects end up on the wrong side of the valued-valueless boundary are not always self-evident, and are least of all economically apparent. Seen from this point of view, 'waste' is ambiguously placed in a liminal state between two categories, in a similar way that 'dirt' is 'matter out of place', following Douglas' definition (1966). The extent to which materials are considered to be 'waste' can be linked to the ways in which production and consumption are socially constructed. The situational and contextual social basis upon which materials are of value or not (and hence become waste), add a significant amount of complexity to the measurement of waste production. However, the ambiguity in defining 'waste' should not be seen as a challenge as much as an opportunity to change the social processes that lead to the overwhelming production of waste in contemporary capitalism.

Yet, why does a study of waste matter at all in studies of economic globalisation? First, a neglect of the study of waste indicates a general disregard for the 'complete' product life cycle. Indeed, many studies have already focussed on the production, distribution, and consumption of products and commodities, but only recently has there been a burgeoning literature that focuses on waste in society.

Scholars have also looked to waste as a resource for further production, or what has been termed as secondary production (see Kikuchi 2001; Bertram et al. 2002). This second round of production is fuelled by environmental concerns and desires to engage in what is believed to be a more 'sustainable society'. While efforts to understand resources and commodities have been made, few studies have gone beyond exploring them in the domestic realm of consumption. As Gregson et al. (2010, p.847) have asserted, commodities are "occasionally followed into the domestic world, but rarely beyond it, in spite of the emerging work on second-hand exchange, consumption and disposal" (see also Gregson & Crewe 2003; Gregson et al. 2007; Reno 2009). Unsurprisingly, the annual disposal and discarding of billions of tonnes of – what can otherwise be recycled/reused – material resources is evidently counter-intuitive to any broad definition of environmental sustainability. In fact, it has been observed that in the United Kingdom, after a period of six months, as little as two percent of input resources (measured according to mass) will continue circulating in the economy, with the remaining 98 percent having been discarded as waste, and this illustration highlights the enormity of material inefficiencies that exist in the contemporary capitalist economy (O'Brien 2008). This enormous figure is made only worse when one realises that many other industrialised nations have similarly high material outputs to the environment per capita per annum. To address this enormous challenge, mindsets towards disposal and discard need to be re-evaluated. Linking back to the notion of 'waste' as not static in its definition and in its value, discussions surrounding the common statement of 'reduce, reuse, recycle' take on newfound meaning. Highlighting the need to pay attention to the temporal and

spatial context of meanings ascribed to commodities, Gregson et al. (2010, p.848) suggest that,

> [l]ooking at the back-end of the value chain and at commodities of rubbish value does not merely extend the following of things over more of their social and economic lives. It is more profound than this. For what it does is to destabilise the thing itself. It shows that the thing is multiple, mutable and material; and that the thing and the commodity are but moments in the circulation and assembling of material.

Indeed, it has been stated that efforts at waste reduction are about "extending the social, cultural and economic lives of things (and materials) by another name" (Bulkeley & Gregson 2009, p.930). In recognising this need to extend the 'life' of material resources and products, we are forced to confront the reality that "remains are not the end of value, but the starting point of its creation" (Pellizi 1995, quoted in Norris 2008, p.420).

The 'end' of a commodity chain or a production network must not be seen in the consumption of the commodity or product, but rather should be viewed as a point that almost does not occur, given that under recycling/reuse, the disposed or discarded products can be re-inserted as the production inputs for another commodity chain or production network. Consequently, the (re)discovery of value in what was deemed to be 'waste' serves as the beginning of another chain or network, which itself will feed into other subsequent chains and networks. From this perspective, "rubbish is no end point but rather a fulcrum point" (Gregson et al. 2010, p.853). This hypothetical never-ending cycle of production – consumption – recycle – production embodies the argument that I present here as the basis and

abiding reason for the need to explore the theoretical and material bases of waste in GVC/GPN studies. Moreover, engaging with 'waste' presents GVC/GPN scholars with an opportunity to participate in debates surrounding the "multiple, mutable and material" (Gregson et al. 2010, p.848) meanings ascribed to objects, whilst relating to "a reading of commodity chains not simply as chains of production but also as involving flows of meaning that become transformed as commodities move through various parts of such chains" (Bridge & Smith 2003, p.264; see also Cooper 2008; Cooper 2010). Indeed, 'waste' should not be viewed as being worthless, but rather "waste almost always has the potential once again to become a valued and valuable material" (Dicken 2011, p.470).

Second, the cross-border movement of waste, in particular hazardous waste, is an important global issue that needs to be considered and addressed, due to the high volumes and dangerous toxicity of the waste. The Secretariat of the Basel Convention on the Transboundary Movement of Hazardous Waste, under the purview of the UNEP, is the international competent authority on this issue at present. According to the Secretariat of the Basel Convention (www.basel.int), in 2006, Singapore exported almost 60 thousand metric tonnes of hazardous waste, whilst Malaysia only exported about 6 thousand tonnes. In the same year, Singapore imported about 200 metric tonnes of hazardous waste, whilst Malaysia imported about 175 thousand metric tonnes of hazardous waste. These indicate that Malaysia and Singapore are significant nodes in global e-waste trade. Accordingly, Malaysia and Singapore have been selected for this research for two reasons. First, Malaysia and Singapore are key nodes in the global transhipment of waste, particularly e-waste (see Sections 1.1 and 4.3). Second, Malaysia and

Singapore, being more developed economies relative to their Southeast Asian counterparts, are significant producers of e-waste.

One of the most profound developments in recent decades has been the movement of waste across great distances on a global and international scale (UNEP & The Basel Convention Secretariat 2002; UNEP 2004a; UNEP 2004b; UNEP 2006; Wong et al. 2007; Ladou & Lovegrove 2008; Stephenson 2008; European Environment Agency 2009; UNEP 2012). Similar to the ways in which firms seek out tax-havens and union-free labour havens, so too do these firms seek out havens for their hazardous wastes. This global mobility of waste can be attributed to a significant extent to the existence of broad differences in the nature, implementation and stringency of environmental regulations by various nation-states at all scales. This ambiguity provides firms with the opportunity to take advantage of this 'environmental arbitrage', which sees the export of waste materials from regions of higher regulation to that of more relaxed regimes, most often seen in a global movement of waste from the more 'environmentally-conscious North' to the apparently more 'environmentally ignoramus South'. An example is that of the serious environmental problems facing newly industrialised economies in East and South Asia. Highlighting the uneven geographies of waste management, Hudson (2005, pp.194-196) argues that governments at various geographical scales play an important role in regulating (or not) the global flows of waste, both in and out of their territories:

> This differential capacity to pollute and produce dangerously in part reflects the increasing involvement of national states with environmental regulation, which creates opportunities and

> constraints for companies in their locational strategies. As a result of this, and changes in production and transportation technologies, 'dirty' industries and the production of pollutants can to a degree be shifted to spaces where their localised impacts are more tolerated… [Due to the tightening of environmental regulations], companies began to relocate 'dirty', hazardous and polluting production activities, initially to peripheral regions within their home national territories but increasingly to parts of the global periphery… [Indeed, for firms] exporting them [waste] was often cheaper than dealing with them at home, and made easier when recipient countries were misled about the nature of the wastes and/or had authoritarian non-elected governments who neither knew nor cared (see also Hazarika 1987; Lapierre & Moro 2009; Shrivastava 1992; Hudson 2009).

With the escalating volume of waste traversing across the world, Gille (2010, p.1062) challenges scholars to fill this void where

> more research is needed to analyse how the production, representation, and the politics of waste all leech across national borders; and we need a more nuanced understanding of how local and national waste actors and practices deflect or use global ones, rather than simply assuming that the global impinges on the local and the national.

Third, waste issues are important because they draw attention to serious problems surrounding social justice. Put bluntly, the rich are significantly more represented in the waste production arena (i.e. those who create waste), while the poor are often the ones who suffer more compared to the rich in relation to the negative effects of (im)proper waste management and disposal (see Hudson 2005). Indeed, the significant amount of waste that is transported from the 'rich' to the 'poor' has continued to drive the rift between the two polar opposites of the social spectrum. For example, in Nigeria, it is workers in the informal sector that form the bulk of waste industry employees, many working in precarious and often dangerous

employment conditions; furthermore, "these groups of people… suffer various forms of social exclusion, especially their non-recognition by authorities and non-participation in the process of governance, lack of access to clean water, sanitation and energy, lack of access to social security, medical benefits or housing" (Nzeadibe & Anyadike 2010, pp.1284-1285). By sending waste to the peripheries, for people who live on the peripheries of both social and geographical worlds to sort and dispose of, rich nations are further marginalising poorer nations and communities in spite of their claims to be aiding the poorer nations by offering technological knowledge transfers and employment opportunities (Cullen 2001; Norris 2001; Servon 2008). The appalling conditions which workers are exposed to in these industries are of standards that regulators in the 'North' would never have allowed. For example, Crang (2010, p.1093) illustrates this vividly when describing two photographs of workers in Chittagong by Sean Smith:

> So a young cutter appears in full-length portrait, where we do not see the actual work, but are left to infer the lack of protective clothing and so forth through the incongruity of the soiled, cheap (Bangladeshi-made) fashion clothes being worn. What comes across in the images is a materiality of the labour process, where the workers are dirty, the place is dirty and the sense of the 45˚C heat is palpable. As a group of workers drag a cable across a ship, we see their feet sink into the glutinous, contaminated beach.

Even within nation-states, the politics of waste disposal are difficult to resolve. Davies (2005; 2008) highlights the politics surrounding incineration in Ireland and the conflicts and protests that occurred when one of the sites chosen was near to a middle-upper class housing estate. The residents effectively canvassed for its relocation and it finally was built in close proximity to a working-lower class

housing estate. This example once again illustrates the desire by the 'rich' to distance themselves from 'waste', and people who work or are living in close proximity to the waste site are similarly portrayed as 'waste' in society. Nonetheless, the trade in hazardous waste is not only a North-South movement. Instead, this thesis (through an examination of the flow of e-waste between Malaysia and Singapore) demonstrates that there is a significant amount of trade occurring among countries in the developing world, what is essentially a South-South movement. Hence, this thesis seeks to conceptualise waste in production networks, and argues that the investigation of waste is important for three reasons: (1) an examination of practices of recycling and reuse illuminates the processes of value (re)creation, enhancement and capture in production networks; (2) conceptualising waste as means of production ('raw materials') sheds light on the importance of the labour process to value creation; and (3) an investigation into the ways waste is reintroduced into production processes illuminates the interlinked nature of production networks.

### 2.2.2 Informal Labour

In this section, I argue that labour – in particular informal labour – while increasingly recognised in GVC/GPN research, still requires much more interrogation, analysis and research before it is recognised for its constitutive role vis-à-vis 'firms' and 'states' in GVC/GPN research (Selwyn 2009b; Phillips 2011; Phillips et al. 2011; Rainnie et al. 2011; Lund-Thomsen et al. 2012; Barrientos 2013; Taylor et al. 2013; Azmeh 2014). Labour has often been viewed as a passive factor of production, with limited or no agency in shaping the networks that they

participate in (Castree 2007; Coe & Jordhus-Lier 2011; Coe 2013; Mitchell 2013). When considered in GVC and GPN research, labour is analysed through a geographically localised lens that sees it as subordinated to the demands of hyper-mobile capital (Castree et al. 2004; Castree 2007; Lier 2007). Furthermore, labour is most often considered through the lens of organised labour and formal employment, thus overlooking a significant portion of the population that is involved in the informal economy or in forms of self-employment (Barrientos & Kritzinger 2003; Lund & Nicholson 2003; Mezzadri 2008; Phillips 2011). To this end, I argue that the GVC/GPN approaches stand to benefit from the enriching presence of informal labour in its conceptualisation by taking into consideration the constitutive role of informal labour in shaping and structuring production networks and challenging the conventional conceptualisation of labour in capitalist relations of production. To achieve a greater appreciation of the constitutive role of informal labour in production networks, I analyse *karung guni* through the lens of petty commodity production. Conceptualising *karung guni* as petty commodity producers sheds light on the contradictions of capital and labour that are personified by *karung guni*, and directs attention to the pivotal role of *karung guni* in the regional e-waste recycling network in Malaysia and Singapore through their collection, dismantling, and sorting of e-waste (see Chapter 5).

The role of labour in shaping GVCs and GPNs has been relatively under-treated in the literature, in favour of a focus on firms (particularly lead firms), in spite of labour being a critical factor in initial formulations for both approaches (Hopkins & Wallerstein 1986; Gereffi 1994; Henderson et al. 2002). However, a recognition of the constitutive role of labour may be traced back to its original beginnings in

global commodity chain analysis, where labour was taken into consideration in the analysis of a chain, with GCCs being described as 'a network of *labour* and production processes whose end result is a finished commodity' (Hopkins & Wallerstein 1986, p.159). This is not to suggest that labour has been left out of the picture *in toto*, or ignored over the decades of GVC/GCC research. What I am arguing however is that the GVC/GCC research has been complacent in addressing the agency of labour in shaping the structure of a given GVC/GCC and indeed, the global economy, for example by influencing the investment decisions of transnational firms, or affecting the possibilities for strategic coupling of regions with transnational firms (Smith et al. 2002; Cumbers et al. 2008a; Taylor 2008; Barrientos 2013; Carswell & De Neve 2013; Azmeh 2014). At present, the GVC framework has been operationalised to examine the consequences of value chain restructuring for employee working conditions and the employment opportunities at the point of production (Bair & Gereffi 2001; Barrientos 2001; Barrientos et al. 2003; Hale & Opondo 2005; Barrientos & Smith 2007; Hale & Wills 2007; Locke et al. 2007).

GCC scholars have been chastised for their lack of consideration of labour in shaping production networks. Smith et al. (2002, p.47) argued that

> insofar as 'workers' are present in the literature, they appear as passive victims as capital seeks cheap labour… this lacuna is surprising given the existence of a great quantity of research on the dynamics and contradictions of the labour process within firms examined in the commodity chain literature in sectors such as clothing, autos and retailing.

However, in spite of its present shortcomings, the GVC approach has provided a lens through which labour can be analysed - capitalising on its relative position in the chain to appropriate opportunities for upgrading. Drawing on the GVC approach, Henderson et al. (2002, p.438, emphasis mine) recognised the importance of labour in shaping the development possibilities and opportunities in the global economy:

> In order to understand the dynamics of development in a given place, then, we must comprehend how places are being transformed by flows of capital, *labour*, knowledge, power etc. and how at the same time, places (or more specifically their institutional and social fabrics) are transforming those flows as they locate in place-specific domains.

In addition, Henderson et al. (2002, p.447, emphasis mine) argued that the "GPN perspective directs attention to the significance of *labour* and the processes of value creation and transfer". Surprisingly though, research has largely failed to properly address the role of labour in shaping production networks (Coe et al. 2008a).

Bair (2005:166) contends that a better understanding of the role of labour in shaping GVCs is necessary to fully appreciate the analytical purchase of the GVC approach. In her view:

> [M]ore careful specification of who benefits from the process of upgrading requires closer attention to the role of workers as chain participants. … Paying more serious attention to labor than it has received in this research to date is necessary to fulfil what the proponents of value chain analysis suggest is one of its primary objectives: to map the distributional incomes resulting from

> participation in international production networks… In this context, it is worth noting that in its original conception, the commodity chain construct recognised the importance of labor, both in terms of labor power as an input of the production process and as a link in the chain which has to be reproduced and is therefore linked to other commodity chains.

Bair goes on to argue that the role of workers in the processes of value creation has been relatively ignored, and that it is important to evaluate the contributions of labour towards value creation, echoing similar arguments made by Smith et al. (2002), and Bair and Ramsay (2003).

Raworth and Kidder (2009, p.165) argue that the omission of labour has significant ramifications for the future direction that production chain and network research would take:

> Not only does it mean ignoring the role of workers in adding value, but it also misses a central dynamic in the analysis: the impact on labor standards and other outcomes affecting workers caused by the way that global value chains are managed.

Raworth and Kidder recognise the dynamic nature of GVCs, highlighting the potential power that labour can wield in shaping any given production chain. Nonetheless, the ability by any (group of) actors to have *power to* and *power over* a given segment of a chain is a dynamic process that varies over time and space. The ebb and flow of power within a chain is a key idea that is explored in GVC and GPN work. Research to date has focussed on the ability of firms (particularly TNCs) as the dominant actors in production network analysis to coordinate the network. Following this vein, Knorringa and Pegler (2006, p.472) for example have

observed that in GVC studies, "the attention was almost exclusively focused on inter-firm relationships, basically neglecting impacts on labour". In a similar manner, the emphasis on the firm has been reaffirmed by Barrientos et al. (2009, p.22) who state that "GVC and GPN analysis have tended to overlook the role of labour, particularly migrant workers, and tended to focus on firms as the main unit of investigation" (see also Hale & Opondo 2005; Pegler & Knorringa 2007). Indeed, by neglecting issues surrounding the conceptualisation of labour in GVCs and GPNs, scholars have neglected an important component of the very approaches that they are employing to understand the contemporary global economy.

Presenting a similar argument, Coe and Hess (2006, p.16) recognise that "workers are barely mentioned in literatures that appear more concerned with firm strategies and upgrading potential". In spite of the exhortation by Smith et al. (2002) for more attention to be paid to labour's agency, Coe et al. (2008a, pp.284-286) argued that little had been done to address this lacuna, and challenged scholars to engage with labour and the labour geographies literature, thus bringing about what could emerge as "a potentially analytically and politically rich line of enquiry that can, in certain contexts at least, serve to reveal the active and constituent role of workers within the value dynamics of GPNs". Coe (2009, p.561) further argues for the importance of looking at the constituent role of labour in production networks, particularly in value creation and contends: "[w]here they are discussed, workers are often seen in economistic terms as an asset underlying the structure of production networks. Equally, the labour process within the firm is rarely explored in relation to dynamics of value creation and enhancement".

In spite of these criticisms, some scholars have aimed to address this under-treatment of labour. Selwyn's (2007; 2009a; 2009b; 2010b) research on workers in the Brazilian grape production industries, where he sought to illuminate the conditions and practices of labour in grape export horticulture was an important contribution that illuminated how changes in global markets, commodity chains and local conditions can – under the right conditions – lead to gains for workers (see also Herod 1999; O'Neill & Gibson-Graham 1999; Castree 2000; Herod 2000; Castree et al. 2004; Castree 2007; Coe et al. 2008a; Herod 2012). Similarly, Cumbers et al. (2008) have sought to understand the role of labour unions and the effect that organised labour can have on the configuring of production networks and value chains (see also Collins 2000; Barrientos 2001; Barrientos & Kritzinger 2003; Quan 2008; Raj-Reichert, 2011; Wad 2013).

Despite efforts made to address the lacuna of work on the role of labour in GVCs and GPNs, much work is left to be done. Several scholars have highlighted the potential benefits to be gained from this line of inquiry. Raworth and Kidder (2009, p.185) suggested that "[g]lobal value chain analysis helps workers' organizations have a more accurate understanding of power relations in the industry and to identify the actors and practices that have the most negative impact", and furthermore, the ability to uncover this conceptually and empirically rich terrain "can only be realised however, if global value chain analysis does not take the firm to be the smallest unit of analysis but goes one step further to integrate the impacts on workers of chain pressures and dynamics" (2009:189). According to Coe et al. (2008a, pp.284-285),

> A major need, therefore is to link work on GPNs more explicitly with work within 'labor geographies'... [which] desire[s] to open up analytical space for the agency of workers, and work groups to shape the geographies of capitalism… [W]e need to recognise that workers have the agency to strive to improve their relative position and, at the same time, to contribute towards reshaping economic geographies.

The dialogue between GPN scholarship and labour geographies scholarship will undoubtedly contribute towards improving understanding of labour in the contemporary economy by recognising the constitutive role of labour in production networks. Labour geographies research emphasises labour as the entry point for its research, and thus contributes to GPN research by moving the focus away from the present emphasis on the (lead) firm. Nonetheless, a missing component is the informal economy and indeed, labour in the informal economy (Phillips 2011). The informal economy is important in two ways. First, up to 45% of urban employment is found in the informal sector in 'developing countries' (Harriss-White & Gooptu 2001; Naughton 2007; Perry et al. 2007b; UN ECLAC 2008; Vuletin 2008; Breman 2010; Abdih & Medina 2013). Even in 'developed countries', the informal sector is an important component of the urban economic fabric (Williams & Windebank 1998; Williams & Windebank 2002; Williams 2009), and is "embedded in richer as well as poorer regions and societies of the world" (Phillips 2011, p.311). Second, the informal sector is linked with the formal sector and global production networks through a myriad of articulations and relationships (Cheng & Gereffi 1994; Bose 1998; Barrientos & Barrientos 2002; Barrientos & Kritzinger 2003; Alter Chen 2006) for example, through the provision of sanitation, recycling and waste management services, and services that support social reproduction including childcare and housecleaning services (Portes 1978;

Roy 2005; Wilson et al. 2006; Rochat et al. 2008). In GPN studies, little has been said of their relationships with other actors in the networks, and much less has been discussed on their roles in any GPNs. Phillips (2011, p.381) argued that "[d]espite the wealth of scholarship on informality and informal economies across the social sciences, however, theoretical and empirical attention to informality remains rather limited in the contemporary study of GPNs". It is this void that this thesis addresses through the conceptual lens of petty commodity production in the case of *karung guni* in Malaysia and Singapore.

In Chapter 6, I focus on the articulations of informal labour with the regional e-waste recycling network in Malaysia and Singapore, and analyse the strategies employed by them to ensure their social reproduction and survival. To this end, I argue that there is a need to conceptualise *karung guni* within these social relations of production in order to redress the relatively under-researched position of informal workers in GVC/GPN research. According to Marx (1990), the informal economy (and the unemployed) exists as the 'industrial reserve army' that is maintained at the disposal of capital, and plays an essential role in providing a low-wage reserve of labour. The informal economy, whose *modus operandi* differs from that of the capitalist market, continues to grow and is seen to be a platform for the formulation of alternate forms of economic activity (Lee et al. 2004; see also Offe & Heinze 1992). Viewed in the contemporary context, the informal economy continues to exist alongside the rise of temporary and contractual employment that increasingly is exemplified by short-term employment that is often unstable and uncertain. Often filling jobs in the unskilled or semi-skilled industries, the informal economy relies on the vicissitudes of

capitalist markets, and is thus often the first to feel the blow when economic crises occur. Two key forms of exploitation of the informal economy by capital occur: first, the informal economy provides for cheap goods and services, which results in downward pressure on wages; second, the informal economy continues to serve as a source of cheap labour that is 'disposable' and easily replaceable. Taken together, these two forms of exploitation subject the workers in the informal economy to precarious employment and survival opportunities (Turner 2013).

Broadly speaking, workers in the informal economy lack social protection (Williams & Windebank 1998). They are also often un-unionised, and therefore lack political voice. This lack of employment security means that informal economy workers have very unpredictable levels of income, leading to extremely constrained livelihoods, with little placed in savings. Often surviving on hand-to-mouth subsistence, the informal economy comprises up to 85% of a country's population in developing countries (Perry et al 2007a). The incorporation of these people into the formal economy has been a matter of debate amongst development scholars who see the eventual withdrawal of the informal economy as an evolutionary step in economic development, whilst for politicians it is seen as a necessary step towards greater labour control regimes (Mazumdar 1976; Bromley & Gerry 1979).

However, the picture is not always a bleak one for the informal economy. On the one hand, informal economies have been viewed with derision, as social blight on an urban landscape. On the other hand, studies by the ILO and Hart (1973; see also Bangasser 2000) have shown that the informal economy is a hotbed for the

flourishing of creativity and resilience, providing high levels of efficiency in their use of resources. This perhaps more 'positive' perception of the informal economy indeed challenges the view that the informal economy is residual or peripheral to the formal economy, and reinforces the understanding of the informal economy as an essential part of the contemporary global economy, regardless of its size and level of participation.

Rather than perceiving the informal economy and formal economy as being dichotomous, I agree with the view of several scholars who have suggested that the distinction should be seen in terms of a spectrum, with each category at either end (Boeke 1953; Geertz 1963; Santos 1979). Undoubtedly, no national economy can exist exclusively in the realm of either extreme end of the spectrum, and indeed, activities in the informal economy are often intersecting with those of the formal economy (Gibson-Graham 2008). *Karung guni* in Malaysia and Singapore (a focus of this research) are a group that traverse both the formal and informal economies in their daily work. *Karung guni* are members of the informal economy, and can be conceptualised as petty commodity producers due to the nature of their work that is marked by their own ownership of their own labour power, the nature of the transactions that take place between them and their clients being through relationships of trust rather than the market mechanism, and their lack of formal labour security (Moser 1978; Gerry & Birkbeck 1981; Goodman & Redclift 1985). However, their interactions with the formal economy are significant. First, the waste materials that they collect are sorted and packaged to be sold to commercial wholesalers, who then re-introduce the recycled materials into the commercial

production network. Second, the materials that *karung guni* men sell are transacted at prices determined by the market.

In this section, I have argued that there exist two key lacunae in the GVC/GPN literature. First, waste has been under-treated, and I have argued that an interrogation of waste sheds light on the potential for value (re)creation in production networks. Moreover, an examination of waste shifts the emphasis away from production–distribution–consumption in GVC/GPN research, and instead focuses on the linkages between production networks by conceptualising waste as 'raw materials' for subsequent rounds of production (see Chapter 5). Second, labour, particularly informal labour, has received relatively little attention in GVC/GPN research. To this end, this thesis argues that informal labour is a pivotal constituent of the regional e-waste recycling network in Malaysia and Singapore (see Chapter 6). Emerging from a recognition of these two lacunae, the following section presents the research questions of this thesis, and discusses how these questions contribute towards enriching research into production networks.

## 2.3 Research Questions

Having briefly reviewed the salient literature to this thesis, the following research questions are informed by the critique of GVC/GPN research as discussed in section 2.2.

> How are recycled e-waste *revalorised* and (re)introduced into the production network? Who performs these functions and who controls the production network?

In the first research question, I investigate how 'waste' may be integrated into conceptualisations of GVCs/GPNs, in particular in relation to studies on input-output structure and value. In Chapter 4 I seek to interrogate how e-waste is (re)introduced into the production network, and also examine why the 'waste' is being recycled. In addition, I examine who decides what, how much and at what price e-waste is recycled and traded. A way to understand this question is to look at the processes, practices and politics involved in taking a piece of e-waste and transforming it into raw materials for secondary manufacturing. What do I mean by "recycling e-waste materials"? These refer to the television sets, mobile phones, and personal computers that are discarded by consumers who perceive them to be of little or no value. This e-'waste' is subsequently collected by *karung guni*, who then sort and sell the e-'waste' to wholesalers who collect in bulk, and then further sort the e-'waste' before selling it off to e-waste recycling firms who recover the precious metals and sell the recovered precious metals as raw materials for new products to manufacturers. In this sense, the recycled e-waste is "reintroduced" into the production network. Having been already through one cycle of production, distribution and consumption, and subsequent discard, the materials have been harvested to be put to use as raw materials for production once again through the labour process (most significantly by *karung guni*). Indeed, several questions emerge out of this: Who and where are the actors in the e-waste recycling

network? What types of activities are taking place at the various geographical locations of the chain/network? How are the actors in the e-waste recycling chain/network related to one another? What power relations exist between the actors in the chain/network? Who exerts governance over the e-waste chain/network? How is 'waste' revalorised? By investigating these questions, I aim to emphasise the critical role of 'waste' in GVC/GPN studies, and how this might contribute to a rethinking of the framework – one that looks beyond the point of consumption, and into disposal and subsequent recycling that allows 'waste' materials to re-enter into the production cycle (Dicken 2011; Lepawsky & Mather 2011; Brooks 2013; Herod et al. 2013; Herod et al. 2014; Pickren 2014a).

> How and why is the informal economy significant in shaping the development and structure of the e-waste recycling network? What is the role and scale of the informal economy in the e-waste recycling network?

In the second research question, I seek to examine how the informal economy – in particular, informal labour (*karung guni*) – is articulated with the wider regional e-waste recycling network. This second question sheds light on issues surrounding social reproduction and survival strategies, employment conditions and the potential means for the informal economy to leverage their role in the e-waste recycling network to meet their daily needs (Barrientos et al. 2011; Selwyn 2013). Indeed, this research question seeks to problematise present conceptions of the informal economy as backward and reliant on the 'formal' economy, and instead seeks to writ large the crucial role of informal economy labour in the daily

processes and practices of production in the contemporary global economy as demonstrated through an investigation into the articulations of *karung guni* in the regional e-waste recycling network in Malaysia and Singapore. Some subsidiary questions that emerge from the second research question include: What functions are performed in the informal economy in the e-waste industry? How is 'waste' re-valorised by the activities of the informal economy? How do commercial recycling firms and the government relate to the informal economy?

> How does my research problematize present understandings of GVCs/GPNs with regard to 'waste' and the informal economy?

The third question seeks to contribute to theoretical discussions concerning the GVC/GPN approaches by incorporating the insights gained from an exploration into the e-waste industries and the role of the informal economy. Two significant issues emerge from this thesis that may problematize present understandings of the GVC/GPN approaches. First is the question of 'value'. Through the labour process, e-waste is revalorised, whereby its *latent use value* is rediscovered. How can researchers better understand the process of value creation, enhancement and capture from the insights gained through an investigation into e-waste recycling? Indeed, what insights into the production chain/network can be gained through an analysis of the e-waste chain/network, especially with regard to the input of raw materials that have been sourced from recycled products? Second, the thesis seeks to identify and emphasise the role of the informal economy in the e-waste industry. Importantly, the thesis seeks to account for the constitutive role the

informal economy plays in the e-waste GVC/GPN through its activities. As such, the thesis challenges the GVC/GPN approaches to account for the significant contributions of the informal economy towards regional development (Meagher 2010; Gill 2009). Indeed, what is of significance in this thesis is how an investigation into the e-waste industries in Malaysia and Singapore may contribute towards knowledge building about the e-waste industries across other national contexts, especially those in developing countries where the informal economy remains a major contributor to the national economy.

## 2.4 Conclusion

In this chapter I began by arguing that the GVC and GPN approaches are not opposing concepts, but rather – echoing Bair (2009) – are methodological tools that may be deployed by researchers to answer different research questions, and approach research from different perspectives. After a brief overview of the key literature in GVC and GPN scholarship, I discussed five key elements of GVC/GPN that are most salient to this thesis: 1) input-output structure; 2) chain governance; 3) value; 4) territoriality/territorial embeddedness; and 5) institutional context. I argued that the five elements bring into focus significant dimensions of production networks, and contribute to a comprehensive understanding of the production network under scrutiny. In section 2.2, I identified two key areas of research that have been relatively neglected in GVC/GPN scholarship: waste and the informal economy. Through an empirical focus on these two categories, the aim of this thesis is to expand and deepen conceptualisations of value and labour within

GVC/GPN research. An investigation into waste is significant in expanding the ambit of GVC/GPN approaches into considering the politics, processes and practices that occur *post*-consumption. In addition, an analysis of waste in production networks sheds light on the possibilities for value (re)creation, through a conceptualisation of waste as "raw materials" to be inserted into production again. An interrogation of the already existing articulations of informal labour, in particular *karung guni*, expands the conceptualisation of labour in GVC/GPN research to take into account this under-treated group of workers. In addition, an interrogation of the role of *karung guni* in the regional e-waste recycling network illuminates the constitutive role of labour in production networks. Section 2.3 set out the research questions that this thesis addresses in Chapters 4, 5 and 6. In the following chapter, I examine the methodology and methods that were undertaken to examine the research questions set out in section 2.3.

# Chapter 3

## Researching Waste and Informal Economies in the Global Economy

## 3.0 Introduction

The methodology of this thesis finds its foundations in the objective of analysing interactions and relationships amongst the various stakeholders in the regional e-waste recycling network in Malaysia and Singapore from the vantage point of each group of actors. In particular, attention is paid to how different actors engage in strategies and economic decisions that influence the e-waste recycling network at various geographical scales, and how these are indicative of the differentiated social relations among actors, including their relative ability to coordinate and control activities in the regional e-waste recycling network in Malaysia and Singapore. The key objective of this analysis is the mapping out and unravelling of the vertical relationships amongst households, small commercial firms, *karung guni*, e-waste wholesalers, e-waste recycling firms, product manufacturers, and governments at regional and national geographical scales. Simultaneously, this thesis seeks to identify the horizontal interactions among these actors, and how they are engaged in relationships of cooperation and competition. For instance: competition amongst *karung guni*, non-governmental organisations, and commercial municipal solid waste collectors in the collection of e-waste; cooperation between governments at various scales and commercial e-waste recycling firms in the drive to increase e-waste recycling rates in their areas of jurisdiction; and competition and cooperation among individual *karung guni* in the collection of e-waste.

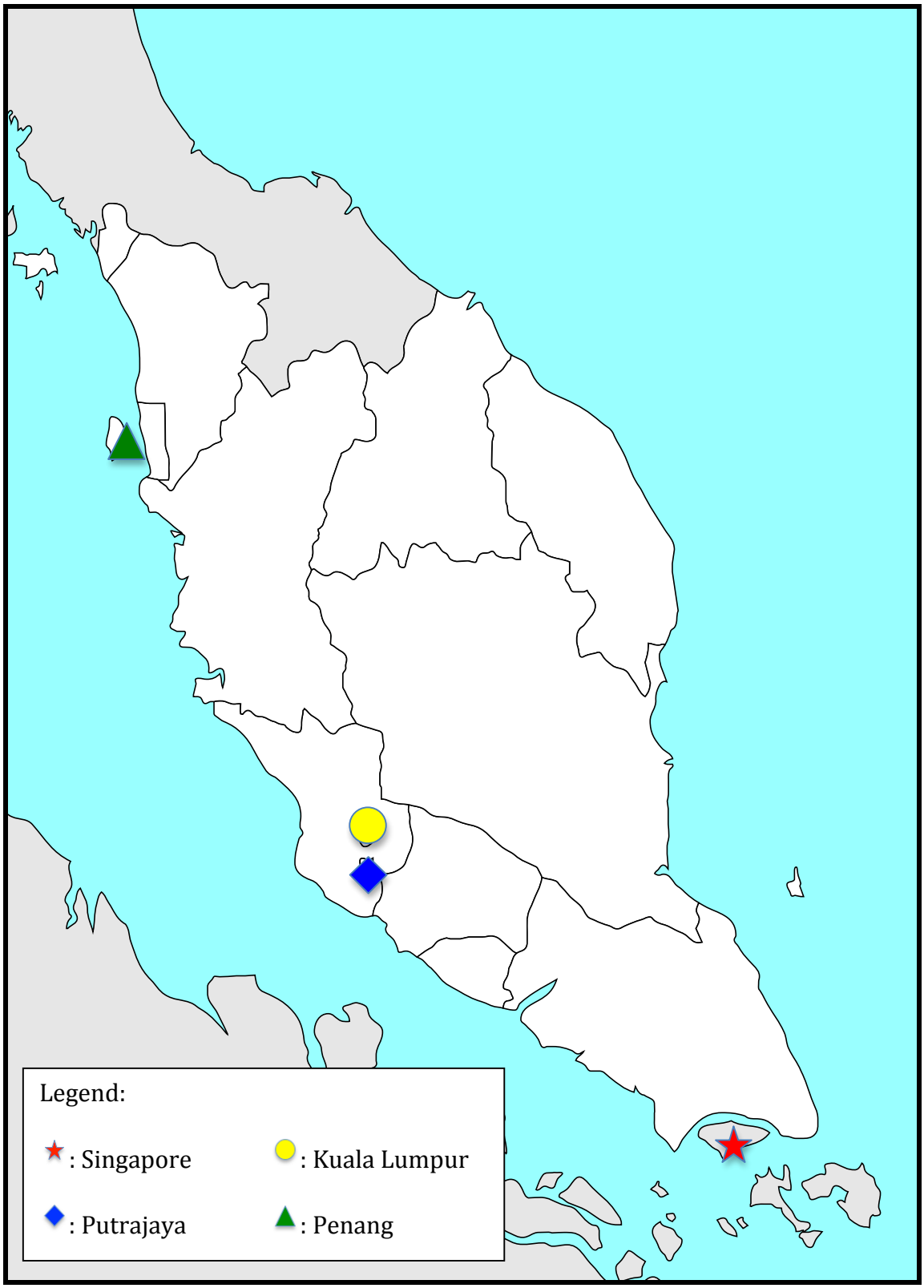
Conducting GVC research has its challenges, as noted by Neilson and Pritchard (2009, p.57), who argued that "the task of undertaking GVC research is methodologically taxing", and that "the problem of 'how to do' GVC research remains a vexing problem for researchers". Nevertheless, bearing in mind the aim of examining the mechanisms, processes, social relationships and interactions within the regional e-waste recycling network in Malaysia and Singapore, a qualitative methodology was identified as the most suitable means to achieve the aims of this thesis, and comprised formal semi-structured interviews, informal unstructured interviews (particularly with *karung guni*) and field observation. Indeed, Sturgeon (2006, p.47; emphasis mine), reflecting on GVC research methodologies, argued that "[a]n understanding of… industry- specific factors, and their interaction, requires deep knowledge of specific industries and occupations that *can only be gained through qualitative research methods*". Adopting a qualitative methodology enabled me to interrogate the important questions of "why" and "how" in a more in-depth manner (Baxter & Jack 2008). Wherever possible, I triangulated data across interviews and field observations. Field observations were at times the basis for further investigation, as seen in the instance when the living conditions of *karung guni* were observed, which led to further interviews to understand the social reproduction opportunities and strategies of *karung guni* (see section 6.3). The methodology is informed by practice-oriented research in economic geography that seeks to understand the ways in which economic actors seek to better their survival capacity through strategies and tactics that are practiced in an effort to improve their value creation, enhancement and capture opportunities (Jones & Murphy 2010; Stenning et al. 2010; Jones & Murphy 2011). The main themes of this thesis are informed by

theoretically identified research questions that emerged from an analysis and review of the literature on GVCs and GPNs.

**Figure 3.1: Map of Southeast Asia with Enlarged Area in Figure 3.2 Marked**


Adapted from: D-Maps Free Maps (www.d-maps.com)

**Figure 3.2: Map of Malaysia and Singapore, Indicating Field Sites**




Adapted from: D-Maps Free Maps (www.d-maps.com)

Fieldwork and data collection was carried out in Kuala Lumpur – the federal capital and largest city in Malaysia; Penang – a state in northwest Peninsula Malaysia that has a high concentration of electronics manufacturing firms and e-waste recycling facilities; Putrajaya – the federal administrative centre and seat of government of Malaysia; and in Singapore (Figures 3.1 and 3.2). Fieldwork was conducted between July 2011 and July 2012, with a repeat visit to Singapore made in December 2012. A full list of interviewees is detailed in Appendix 1.

A total of 201 interviews were carried out, comprising 38 in Kuala Lumpur; 57 in Penang; 4 in Putrajaya; and 102 in Singapore. In total, 87 interviews were carried out with *karung guni* (41 in Malaysia, 46 in Singapore); 25 with e-waste wholesalers (14 in Malaysia, 11 in Singapore); 20 interviews with government officials of various levels (12 in Malaysia, 8 in Singapore); 34 interviews with partial and full recovery e-waste recycling firms (20 in Malaysia, 14 in Singapore); 6 interviews with original brand manufacturers (2 in Malaysia, 4 in Singapore); 6 interviews with contract manufacturers (3 in Malaysia, 3 in Singapore); 8 interviews with municipal solid waste firms (4 in Malaysia, 4 in Singapore); 6 interviews with small and medium firms (2 in Malaysia, 4 in Singapore); 4 interviews with electrical and electronic repair shop owners in Singapore; 2 interviews with town council waste collectors in Singapore; 2 interviews with public housing residents in Singapore; and one interview with an environmental non-governmental organisation official in Penang.

In addition to interviews, non-participant observation was used as a method to gain deeper insights into the practices and politics within the regional e-waste

recycling network in Malaysia and Singapore, in particular "to understand the world-views and ways of life of actual people from the 'inside', in the contexts of their everyday, lived experiences" (Cook 2005, p.167). Yeung (2007, p.286) argued that this method was "valid and reliable… to 'follow through' [the] networks" under investigation. In this sense, non-participant observation is an effective means of gaining greater understanding of the organisation and development of production networks, while also providing an avenue to "learning the explicit and tacit aspects of culture" (Dewalt et al. 1998, p.260) being analysed. Non-participant observation "involves spending time being, living or working with people or communities in order to understand them" (Laurier 2003, p.133; see also Jackson 1983; Dewalt et al. 1998; Cook 2005), and relies on trust-based relationships between researcher and research subjects. Information gained from non-participant observation "is as critical to social scientific analysis as more formal research techniques like interviewing, structured observation, and the use of questionnaires and formal elicitation techniques" (Dewalt et al. 1998, p.259). When combined with other research methods such as interviews (as employed in this thesis), non-participant observation enables the researcher to "reach a better understanding of the beliefs, motivations, and behaviours of their subjects" (Tedlock 2003, p.190).

In this thesis, non-participant observation was carried out in particular in the investigation into the lives of *karung guni*, and this included accompanying *karung guni* on their collection rounds, observing *karung guni* during their primary processing of e-waste in their homes, and in the sale of primary processed e-waste by *karung guni* to e-waste wholesalers and e-waste recycling firms. Non-

participant observation was important in this thesis in two ways. First, it reinforced the information gained through interviews. For example, through non-participant observation, a richer account of the bargaining process between *karung guni* and e-waste wholesalers was attained (see section 5.4). In addition, non-participant observation included my socialising with *karung guni* during their breaks, when they gathered at coffee-shops (see section 4.4.2). In this sense, non-participant observation provided an opportunity to witness the tacit exchange of information among *karung guni*, while also providing an occasion to establish more potential interview contacts. Second, data gathered through non-participant observation formed the basis for further investigation that became critical in analysing the social reproduction and survival strategies of *karung guni*. For example, the findings presented in section 6.3.4 that investigates the importance of family members in the primary processing of e-waste emerged from an observation of *karung guni* and their families in the home setting. This observation of family members aiding in the dismantling, disassembly and sorting of e-waste in the home-space became the basis for further investigation through interviews into the significance of the family in the social reproduction and survival strategies of *karung guni*.

The initial plan was to conduct fieldwork in Penang and Kuala Lumpur in Malaysia, and Singapore, due to the interconnections between these three cities in Southeast Asia – they share a common history in previously being linked together as the Crown Colony of the Straits Settlements and the Federated Malay States (a British Protectorate); and their relatively dense populations, which would be a magnet for *karung guni* due to the proximity of customers from whom they can purchase e-

waste. Furthermore, Kuala Lumpur, Penang and Singapore enjoy high levels of telecommunication and Information Technology connections, thus ensuring that the volume of e-waste produced would be significant (see section 1.3). The administrative capital of Malaysia, Putrajaya, was added to the fieldwork locations as a result of several state level officials in Malaysia deferred their responses to my email requests for interviews to the federal headquarters in Putrajaya.

An original aim was to map the flows of e-waste utilising international trade data. However, a search using COMTRADE Harmonized Commodity Description and Coding System (HS) identified significant limitations in using international trade data in tracing the flows of e-waste between Malaysia and Singapore, and indeed with the rest of the world. Lepawsky and Billah (2011; see also Lepawsky 2014) had used a proxy in their analysis of the global flows of e-waste, by selecting HS code 854810 (waste and scrap of primary batteries, electric accumulators, spent primary batteries and spent electric accumulators) as the basis for their projections of the global flows of e-waste. However, a major limitation of this proxy is that e-waste consists of many more components and products than batteries and accumulators alone. In addition, the global flows of 854810 may be limited to locations where there are facilities for its disassembly and recycling – technology that is not omnipresent across the globe. Moreover, given the apparently major importance of the illicit trade in e-waste (UNEP 2004b; UNEP 2006; European Environment Agency 2009; UNEP 2012; see also Figure 4.4 and 4.6), trade data is unlikely to be a sufficient indicator, even if more HS codes were available. Hence, the conclusions that were drawn by Lepawsky and Billah on the global flows of e-waste are at best partial. I was also unable to find any category in

HS 2002 that exclusively accounts for waste and scrap electronics/electronic components at the six-digit level. Eight-digit codes for other e-waste products from the National Environment Agency, Singapore, were identified but these were not useful as there was no similar measure for analysis in any other countries as codes are established at this level by individual countries. In addition, the data that Singapore reported to the World Customs Organisation is also at the six-digit level, which did not permit me to look exclusively at e-waste. Hence, international trade data did not yield any substantive insights in understanding the global trends of transhipment of e-waste.

The rest of the chapter is divided into the following sections. Section 3.1 examines the adoption of a multi-sited case study approach and assesses its benefits and limitations. In section 3.2, the challenges related to conducting semi-structured interviews and the steps taken to overcome these issues are discussed. Importantly, this section shows the various efforts that were undertaken to draw up a preliminary map of the input-output structure of the regional e-waste recycling network in Malaysia and Singapore, and identify the key actors involved. Noteworthy in this section is the nature of gatekeepers and how personal contacts were of paramount importance in the fieldwork. The difficulties encountered in undertaking interviews with high-ranking government officials and the managers of e-waste recycling firms in Malaysia and Singapore are discussed. In section 3.3, the challenges encountered whilst conducting fieldwork are discussed, specifically in relation to field observations. The solutions formulated to work around those limitations are also detailed. In section 3.4 the strategies employed in analysing and interpreting the data are discussed. The process of writing up is also

examined; specifically analysing how voice is given to interviewees, and how the data from interviewees are supplemented by field observations. Section 3.6 concludes the discussion on methodology.

## 3.1 Spaces and Places of Economic Practices – Multi-Sited Case Studies

The adoption of a multi-sited case study – covering Kuala Lumpur, Penang and Singapore – has provided an important means to analyse the relationships amongst these three distinct places, and enabled an in-depth examination of the contexts, processes and practices within each location. Robert K. Yin (2003, p.1) argues that "case studies are the preferred strategy when "how" or "why" questions are being posed,…, and when the focus is on a contemporary phenomenon within some real-life context" (see also Flyvbjerg 2006; Baxter & Jack 2008). In this thesis, the multi-sited case study approach has been pivotal to understanding how *karung guni* are articulated in the regional e-waste recycling network. Indeed, Peck (2003, p.733) argued that "case studies help us to interrogate the operation of processes under different conditions", thus pointing to the potential for case studies to illuminate similarities and differences between places where apparently similar articulations of social and economic phenomena are at work. According to Helen Simons (2009, p.23), the strengths of case study research include: (1) the ability to study social phenomena in an in-depth fashion, and analyse them within exact socio-political contexts; (2) the ability to "document multiple perspectives, explore contested viewpoints, demonstrate the influence of

key actors and interactions between them"; (3) and to analyse and explain the "processes and dynamics of change".

Consequently, the multi-sited case study approach, vis-à-vis separate case studies, is pivotal in this thesis for two reasons. First, the multi-sited case study approach provides a framework to understand the interconnected nature of the three locations under scrutiny. Second, the multi-sited case study permits comparisons and contrasts between the case studies, and aids in identifying comparative elements that are of significance to the phenomena under investigation for further examination. Thus, in this thesis, where comparative elements of analytical significance between the case study in Malaysia and in Singapore are identified, they are examined further to provide a clearer understanding of the regional e-waste recycling network and the social relations therein.

The multi-sited case study approach also enables an appreciation of the contemporary contexts within which social phenomena emerge, are negotiated, and exist. For example, this approach has permitted attention to the role of the state in enabling social reproduction (in the case of *karung guni*), and in regulating (or not) the international/regional flows of e-waste (see sections 4.4.2 and 6.3.1).

Crucially, the multi-sited case study permits a clearer comparison of the differences and similarities in the articulations of *karung guni* in Malaysia and Singapore, and also to draw comparisons with regard to their strategies to ensure social reproduction and survival (see Chapter 6). While the case study "explore[s] the particularity, the uniqueness of the single case" (Simons 2009, p.3), it also

enables researchers to compare case studies by extracting contrasting characteristics in each case study, thus providing a means to assess the significance of different sets of factors in impacting a given social phenomenon. For example, in this thesis, the multi-sited case study has enabled a comparison of the role of the state in the social reproduction of *karung guni* (see Chapter 6). In addition, the multi-sited case study approach allows for a greater level of generalizability and rigour to be achieved than relying on a single case study (Yin 2003). For example, in this thesis, employing the findings from the multi-sited case study method in Malaysia and Singapore, I have been able to argue that informal labour – in particular *karung guni* – is pivotal and constitutive of the regional e-waste recycling network.

Nonetheless, limitations and disadvantages do exist with the adopted methodology. Darke et al. (1998, p.278; emphasis mine) argued that:

> The data collection and data analysis processes in case study research are both subject to the influence of the researcher's characteristics and background, and *rely heavily on the researcher's interpretation* of events documents and interview material.

Thus, the first limitation identified is that of the subjectivity of the researcher. I have sought to address this critique by triangulating across interviews where possible, and to employ a variety of perspectives through the interview material from a range of interviewees where relevant and applicable.

Second, the issue of the representativeness of the perspectives of actors is considered. Semi-structured interviews have been employed in this thesis as the

key method of obtaining information and data, and has been argued by Yin (2003) as an indispensible source of knowledge and evidence in case study research. Related to this is the recognition that I interviewed only 46 *karung guni* in Singapore, out of an estimated 800 to 1,000 *karung guni* (GvtSgp #3; GvtSgp #4).[2] In Malaysia, interviews were conducted with 41 *karung guni*, with the total population of *karung guni* in Malaysia being estimated at around 10,000 to 15,000 (GvtMys #1; GvtPng #1). Furthermore, in both the cases of Malaysia and Singapore, officials were unable to provide an estimate of the total number of *karung guni* who specialise in e-waste who are the focus of this thesis. Nonetheless, interviews were carried out with *karung guni* and other key actors to the point of 'saturation', and this was identified when additional interviews were not bringing up new issues that had not been discussed by other previous interviewees.

## 3.2 Notes on Semi-structured Interviews – Access and Gatekeepers

Semi-structured interviews are an important means of exploring complex social phenomena, and facilitate an in-depth investigation of 'why' and 'how' questions in research (King 2004). Responses from semi-structured interviews were central to the development of my arguments in the thesis.

[2] The interview coding scheme used in this thesis can be found in Table 3.1. For example, GvtSgp #3 indicates a Singapore government official, with the number following the code used to further anonymise the interviewee.

The initial identification of stakeholders in the e-waste recycling network in Malaysia and Singapore was made easier through internet searches that yielded lists of contacts of commercial e-waste recycling firms in Malaysia and Singapore. These were accessible through the website of the Department of Environment, Malaysia (www.doe.gov.my), and the website of the National Environment Agency, Singapore (www.app2.nea.gov.sg). Armed with the names of the firms that engage in e-waste recycling in Malaysia and Singapore, I proceeded to write to them via email to request an interview. However, only one e-waste recycling firm in Singapore responded. To overcome this, I wrote directly to senior executives in e-waste recycling firms in Malaysia and Singapore, and followed up with a telephone call after a few days in instances where I did not receive a response. During telephone calls, I answered concerns and queries about my research project, and these seem to allay the fears and anxieties that some then-potential interviewees had with regard to my research. This strategy was successful in increasing the total number of interviewees from the initial one to fourteen.

In Malaysia, corporate elites generally perceive researchers with much scepticism (see Cormode & Hughes 1999; Cunningham-Sabot 1999), as evident from the low response rate. Email requests for interviews only garnered two positive responses in Kuala Lumpur and four positive responses in Penang. To overcome this, I sought assistance from the Department of Geography, University of Malaya (UM). Through contact with faculty members I was introduced to one of the main 'gatekeepers' of the e-waste recycling industry in Malaysia (see Oinas 1999; Conti & O'Neil 2007). ENGOPng #1, chairperson of a non-governmental organisation in Penang which has been active in raising awareness on issues related to e-waste management,

was pivotal in my access to interviewees, particularly in Malaysia where he is well known in the e-waste recycling industry. Through ENGOPng #1, I was able to gain access to conferences, roundtable discussions, and many interviewees who had initially rejected my request (see Appendix 3 for a list of the conferences and roundtable discussions attended).

To mitigate the potential sample bias arising from ENGOPng#1's gatekeeping role, I cross-referenced the interviewees that I had gained access to via ENGOPng #1 against my list of contacts of commercial e-waste recycling firms in Malaysia and found them to be identical. The contacts that ENGOPng #1 had helped to establish were major firms in the e-waste recycling network in Malaysia, particularly in Kuala Lumpur and Penang. In addition, the interviewees from the e-waste recycling firms held ENGOPng #1 in high regard, and thus were more open to sharing information with me than they would have otherwise if I had not been introduced by ENGOPng #1. For example, FRERPng #1 mentioned:

> If you are [sic] just another researcher, I would not even bother. You won't get a word out of me. But [ENGOPng #1] is a good friend, … and so here we are.
>
> (Interview with FRERPng #1, Penang)

Government officials in Malaysia were rather sceptical of my research and were initially reluctant to participate. This was linked to two main factors. First, as a foreigner, government officials viewed my request as a potential threat to their legitimacy. For example, GvtMys #2 stated that he was aware of an ex-colleague who had been interviewed by a foreign PhD researcher who subsequently interpreted the responses in a negative light, thus putting in question the

effectiveness of the government ministry in carrying out its duties. Second, government officials were fearful that I would misrepresent their responses, and rejected my requests to avoid difficulties with their superiors. For example, GvtMys #4 mentioned that there was an atmosphere of 'fear' with regard to participating in research as a result of a colleague having been misquoted in a report that culminated in the said colleague being severely disciplined by the management. Hence, in spite of multiple requests for interviews with various government officials via telephone and email, I was flatly rejected on all occasions. A meeting was established with one of the senior officials of the Department of Environment, Malaysia, at a conference in Penang, and it was then that I was able to convince him to agree to an interview. ENGOPng #1 personally introduced me to this senior official, and asked him to assist me in all ways possible. It was through this first contact that I gained access to other government officials in Malaysia, both in Penang, and Putrajaya. Hence, snowballing was a key strategy employed to gain access to interviewees in Malaysia. Although this strategy of snowballing has its drawbacks, including a potential sample bias, it was the most effective in establishing contacts and gaining trust from interviewees who would have otherwise rejected participation in the study or remained tight-lipped about many of their economic practices (Atkinson & Flint 2004).

In Singapore, access to government officials was similarly difficult. Many officials were tight-lipped about the policies and practices of the Ministry of Environment and Water Resources (MEWR) and the National Environment Agency (NEA). Through a personal contact, I was granted an interview with a senior executive in MEWR. Once again, this proved to be the turning point for my research. It was

through this interviewee that I was referred to other officials in MEWR and NEA, and other government agencies including the Ministry of Manpower (MOM), Immigration and Checkpoints Authority (ICA) and Singapore Customs.

Government officials in both Malaysia and Singapore were also very cautious about revealing sensitive information, such as the volumes of e-waste that were sent to landfill or incinerated, and the processes of monitoring the import and export of e-waste. There was also reluctance to share information on the countries to and from which e-waste was transported. In a similar fashion, they were unwilling to discuss the shortcomings in their system of e-waste management, but did provide insights when asked what the state of the e-waste recycling industry would be if *karung guni* were restricted from collecting e-waste. To overcome this problem, I interviewed government officials at various levels of leadership, and thus was able to compare responses within organisations, while gaining additional information that had been initially refused. Undoubtedly, interviewing government officials proved to be challenging. Yet, it was found that government officials were more willing to share information when they were assured of anonymity, and where transcripts were sent to them for subsequent confirmation before being utilised in this thesis.

Building on previous contacts with municipal solid waste (MSW) collectors in Singapore that were established during earlier fieldwork (Wong 2010), access to interviews with managers and senior executives from the commercial MSW collectors in Singapore was possible. These individuals subsequently introduced me to e-waste wholesalers to whom they sold e-waste. Through these contacts in

Singapore I was able to arrange for interviews with commercial MSW collection firms in Malaysia.

Trust was a major issue in my interviews with senior executives of e-waste recycling firms, and was again gained through introductions and referrals from others in the industry (see O'Neill 2007; Pratt & Johnston 2007). In two instances each in Penang and in Singapore, and one instance in Kuala Lumpur, the senior executives that I interviewed invited me for a repeat interview, and two even subsequently took me on a tour of their premises – a request that was rejected at the initial interview. On-site observations and visits to the e-waste recycling facilities are discussed further in section 3.3. FRERPng #2 succinctly explained this shift in perception:

> Information for us is crucial. When you came the first time, I was not sure about how truthful you are about your work, or if I can tell you sensitive information…. No doubt that you were introduced by ENGOPng #1, but still, I have to be careful. There is a lot of money at stake if I told you too much and you told others.
>
> (Interview with FRERPng #2, Penang)

Indeed, during interviews with government officials and senior executives of e-waste recycling firms, I often found them to be like "pufferfish": intentionally gave short answers and chose to pass on many questions that I asked (Dunn 2007; see also Desmond 2004). Phrasing my questions differently, or repeating questions after they had started to divulge other information more willingly overcame this obstacle. This strategy generally worked in garnering more information from the interviewees, but it was usually about halfway through the interviews that they

became more forthcoming with their responses. During the process of interviewing senior executives, it was observed that the mutual respect between the interviewee and the researcher was something that I needed to gain gradually through asking focused questions – but not appearing over-familiar with the industry – and being confident, rather than submissive and nervous which may instead garner patronizing responses from interviewees (King 2004, p.19).

Another issue that emerged in interviews with senior executives of e-waste recycling firms, both in Malaysia and Singapore, was the question of illegal practices. Several times during the interviews, I was informed that the e-waste recycling firms operated absolutely above-board and were transparent. However, when probed further, many interviewees admitted that it was 'part and parcel' of the industry to have illegal operations that included tax evasion, illegal trans-shipment of e-waste, and practices that did not meet the environmental regulations of the countries. This sensitive information was shared with me on condition of anonymity.

Overall, interviews in Singapore were significantly easier to organise than those in Malaysia due to my identity as a Singaporean and having quite a few established contacts through a previous research project on the mobile strategies of garbage collectors in Singapore (Wong 2010). My fluency in English and Mandarin, in addition to Chinese dialects (*Teochew, Hokkien* and *Cantonese*) which are spoken by many Singaporean *karung guni*, aided in gaining the trust of many of my interviewees, and enabled me to garner more candid responses from them. Interviews in Malaysia were more challenging as I am not as fluent in *Bahasa*

*Melayu* (Malay language), although I have a working understanding of the language that permits me to converse comfortably. Interviews with Malaysian government officials and senior executives of e-waste recycling firms were all conducted in English, with a smattering of *Bahasa Melayu* when the interviewees found difficulty in understanding me or in expressing themselves. Interviews with *karung guni* in Malaysia were conducted in Mandarin, or a mixture of Malay and English.

In the course of my interviews with Malaysian *karung guni*, there were times when I feigned ignorance of *Bahasa Melayu*, or declared myself to be lacking in fluency in Mandarin, and it was on these occasions that I gained greater insights into the livelihood strategies employed by Malaysian *karung guni* as they went to great lengths to clarify and explain in great detail their daily routines and negotiation strategies that they employed with e-waste wholesalers, households and government authorities. In these cases, *karung guni* would ask for assistance in translation from a friend of theirs who was more fluent in English, and in this way, I was able to ask more questions, and *karung guni* reciprocated by being more open with me. Rather than hindering the openness of *karung guni* in sharing information, the presence of an interpreter in these cases made *karung guni* more at ease in responding to my questions. When conducting interviews in Malaysia, it was sometimes observed that the interview material that was shared in English did not have the same level of detail as when interviewees spoke in *Bahasa Melayu*. Hence, after the first few interviews, to overcome this challenge, where the responses were given in English and lacked further detail, I would probe into the

issue by asking the questions in *Bahasa Melayu*, and would often get much finer points in the responses given by interviewees.

All interviewees were briefed on the nature of the research and were assured of their full anonymity. To this end, all interviewees have been assigned codes with individual numbers attached, as shown in Appendix 1. Table 3.1 shows the categorisation of codes that have been used. In addition, I assured them that all of the data collected would be kept in a secure manner and would in no way be attributed to them as individuals unless they explicitly agreed.

Specific interview sheets were formulated for each category of interviewee (for instance, *karung guni*, government officials, e-waste wholesalers, e-waste recycling firms). The formulation and sequence of questions were structured around the primary research questions, and were concerned with mapping the regional e-waste recycling network, particularly in Malaysia and Singapore, identifying the chain relationships within this network, the distribution of power and the nature of negotiation strategies, and the role of *karung guni* in the network.

Importantly, the interview sheets (Appendix 2) contained several similar questions to permit comparisons between responses from different groups, and enabled subsequent triangulation across transcripts. Interviews lasted for an average of one and a half hours, with the shortest interview being forty-five minutes and the longest lasting almost three hours. All the government officials in Malaysia and Singapore agreed to have the interview recorded, and permitted me to take written notes that I would subsequently write up. In an effort to confirm

**Table 3.1: Categorization and Coding of Interviewees**

| Key | Notes |
|---|---|
| CtMfPng | Contract manufacturer, Penang |
| CtMfSgp | Contract manufacturer, Singapore |
| EERpPng | Electrical and electronic repair shop owner, Penang |
| EERpSgp | Electrical and electronic repair shop owner, Singapore |
| ENGOPng | Environmental non-governmental organization, Penang |
| FEWKul | Formal e-waste wholesaler in Kuala Lumpur |
| FEWPng | Formal e-waste wholesaler in Penang |
| FEWSgp | Formal e-waste wholesalers in Singapore |
| FRERKul | Full recovery e-waste recycling firm, Kuala Lumpur/Selangor |
| FRERPng | Full recovery e-waste recycling firm, Penang |
| FRERSgp | Full recovery e-waste recycling firm Singapore |
| GvtKul | Government officials in Kuala Lumpur, including Kuala Lumpur City Hall |
| GvtMys | Federal government officials including the Department of Environment, Putrajaya; Royal Malaysian Police; Royal Malaysian Customs |
| GvtPng | Government officials including the Department of Environment, Penang; Penang State Government; Penang Green Council; Municipal Council of Penang Island; Municipal Council of Province Wellesley. |
| GvtSgp | Government officials including the Ministry of Environment and Water Resources, National Environment Agency, Singapore Police Force, Ministry of Manpower, Immigration and Checkpoints Authority, Singapore Customs. |
| IEWKul | Informal e-waste wholesaler in Kuala Lumpur |
| IEWPng | Informal e-waste wholesaler in Penang |
| IEWSgp | Informal e-waste wholesaler in Singapore |
| KGKul | *Karung guni* in Kuala Lumpur |
| KGPng | *Karung guni* in Penang |
| LKGSgp | Licensed *karung guni* in Singapore |
| MSWFKul | Municipal solid waste collection and recycling firm, Kuala Lumpur |
| MSWFPng | Municipal solid waste collection and recycling firm, Penang |
| MSWFSgp | Municipal solid waste collection and recycling firm, Singapore |
| OBMPng | Original brand manufacturer, Penang |
| OBMSgp | Original brand manufacturer, Singapore |
| PHResSgp | Public housing resident, Singapore |
| PRERKul | Partial recovery e-waste recycling firm, Kuala Lumpur/Selangor |
| PRERPng | Partial recovery e-waste recycling firm, Penang |

| | |
|---|---|
| PRERSgp | Partial recovery e-waste recycling firm, Singapore |
| SMEPng | Small and medium enterprise, Penang |
| SMESgp | Small and medium enterprise, Singapore |
| TCWCSgp | Town council waste collector, Singapore |
| UKGSgp | Unlicensed *karung guni* in Singapore |

the accuracy of the content of my interviews, each government official received a transcript of their respective interview, and sent me their amendments and confirmation. Interviews with senior executives from e-waste recycling firms and e-waste wholesalers were less straightforward, with all but two refusing to have any audio recording of the interview. I was however permitted to take written notes, and these were written out in interview transcript form immediately following the interviews.

Interviews with *karung guni* both in Malaysia and Singapore proved to be enlightening and physically taxing. In order to gain the trust of *karung guni*, there were several occasions where I followed them (with their permission) as they went about their collection rounds, and spoke to them informally about their activities. Surprisingly, *karung guni* were very receptive to having their interviews recorded, and were keen on assisting me in introducing other *karung guni*. It was through this method of snowballing that I managed to achieve a total of 87 *karung guni* interviews in Malaysia and Singapore.

However, the snowballing strategy has its drawbacks, including the narrowing of my sample to a limited group that may not be representative of *karung guni* in general. To overcome this, instead of relying on the contacts that were given by a single *karung guni*, I was fortunate to have contacts that stemmed from a group of

initial *karung guni* interviewees (three in Kuala Lumpur, four in Penang, and six in Singapore), and this permitted me to establish a web of contacts among *karung guni* rather than just a single chain of connections. This web of connections among *karung guni* enabled a greater degree of representation of experiences and opinions compared to relying on a single primary source as the origin of all subsequent interviewees. In this sense, by engaging with a larger pool of initial interviewees who were keen on introducing other *karung guni*, I was able to cast a wider net, and thus gained access to *karung guni* whom I may not have been able to interview had I relied on a single primary contact. This strategy proved very successful. Many *karung guni* were very keen on sharing their daily practices – 12 out of 20 in Kuala Lumpur, 13 out of 21 in Penang, and 31 out of 46 in Singapore – often inviting me to join them on their daily rounds, an invitation that I took up whenever it was offered. My willingness to endure the heat and humidity to accompany *karung guni* was perhaps a means through which I gained their trust, which resulted in me being invited to their homes for meals, and to observe how they dismantle, sort and store e-waste in their residences. This invitation to see home-spaces was extended to me often by *karung guni* that I interviewed – 8 in Kuala Lumpur, 11 in Penang, and 28 in Singapore – and provided an important perspective on the importance of home-spaces for *karung guni* and the regional e-waste recycling network in Malaysia and Singapore (see also Chapter 6). For this part of the research process, I wrote field notes upon the end of each visit to document what I had observed and experienced in the home-spaces.

Conferences in Malaysia and Singapore on e-waste management and waste management in general were also effective platforms for networking and to gain

access to interviewees. For example, I attended the Inter-Asia Roundtable 2011 (Recycling Cities), organised by the Asia Research Institute, National University of Singapore, and met many scholars who are similarly interested in analysing the challenges posed by e-waste. In addition, I attended various working group discussions amongst stakeholders in the e-waste recycling industry in Kuala Lumpur and Penang, and these served as effective platforms to share my research, and also establish contacts and gain trust amongst industry players (see Appendix 3 for a list of working group discussions attended).

## 3.3 Reflections on Fieldwork Observation

Field observations proved to be a very important method in gaining a more refined comprehension of the e-waste recycling network in Malaysia and Singapore (see Yeung 2003). For example, although an understanding of the bargaining process between *karung guni* and e-waste wholesalers was gathered from interviews with both *karung guni* and e-waste wholesalers, this was reinforced by the richness of information collected from being physically present to observe the back-and-forth bargaining process at the premises of e-waste wholesalers. This method of data collection thus supplemented information gained from interviews and enabled me to gain a more intimate appreciation of the practices of *karung guni*, and of other actors in the regional e-waste recycling network. My understanding of the relationships and dynamics among actors gained through field observation provided valuable insights into the complex network of social relations that are at play in the regional e-waste recycling network in Malaysia and Singapore.

Of the 87 *karung guni* that I interviewed, I also accompanied *karung guni* on several occasions to observe them whilst they collected e-waste from households, and brought it home to be disassembled and sorted (Figure 3.3).[3] Besides accompanying them on their collection rounds in residential estates, on several occasions I was asked to accompany *karung guni* to meet e-waste wholesalers, and it was through these face-to-face introductions by *karung guni* that I was able to gain access to e-waste wholesalers, who I subsequently interviewed. In this sense, by adopting a partial 'follow the thing' method that has been proposed by scholars as a means of de-fetishizing commodities (see Cook 2004; Gregson et al. 2010; Christophers 2011; Lepawsky & Mather 2011), I was able to gain not only insights into the relationships and chain linkages between actors in the regional e-waste recycling network, but was also able to use this opportunity to gain access to interviewees.

Furthermore, from the in-situ observations that I undertook while observing the exchanges of e-waste (in its various states of (dis)assembly), I was able to obtain a nuanced understanding of power relations and chain governance within the network.

Nonetheless, two important issues emerged through this method of accompanying *karung guni*. First, there is the issue of performativity of *karung guni* whereby they were playing up their experiences, or sharing narratives with me that they perhaps

[3] Note the two computers and laptop to the left of the picture that this *karung guni* had just bought from local households.

**Figure 3.3: Author Accompanying *Karung Guni* To Collect E-Waste**


Source: Author's Photograph

expected me to want to hear (Denzin 2001; Sin 2003; Davies & Dwyer 2007; Davies & Dwyer 2008; Dwyer & Davies 2010). To overcome this potential shortfall, I ensured that the sample of *karung guni* who I accompanied was relatively large, and I compared the accounts that were given against that of other *karung guni*. I also asked questions to other *karung guni* based on information that I received from earlier interviewees. For instance, the question of police harassment

garnered very varied responses, ranging from experiences of abuse by the police to that of assistance from police when *karung guni* found foreign workers collecting e-waste from households (see Chapter 6). Second, there was the ethical issue of what to do when I noticed that *karung guni* I was accompanying were committing illegal acts such as indiscriminate dumping. Instead of reporting the issue to the authorities (which would potentially undermine the trust that *karung guni* had for me), I used this opportunity to ask *karung guni* why they dumped the unwanted e-waste, and what components were dumped. Similarly, I observed several *karung guni*, especially in Malaysia, engage in open-fire burning of circuit boards and copper wires. These practices are detrimental to the environment, but I was left unable to do much more than ask why they did so, and what they gained from these practices.

Field observations at e-waste recycling firms' facilities were closely guarded events that required me to surrender all electronic goods that had recording capabilities. This practice was common through all the facilities that I visited, particularly when I was entering the factory. As a result, I took down as many diary notes as I could about what I observed upon leaving the premises. Site visits to e-waste recycling facilities provided me with an important insight into the technology in use, and also the number of workers in each facility. In addition, field observations at e-waste recycling factories enabled me to document the negotiations that take place between e-waste wholesalers and purchasers from the e-waste recycling firms.

In conclusion, field observation has been a useful means of obtaining important perspectives and supplementing information gained from interviews on the regional e-waste recycling network, and has served as an instrumental platform in gaining access to (potential) interviewees.

## 3.4 Processing the Data and Writing Up

In analysing the data and incorporating it to develop my arguments I was committed to reflexivity and giving voice to my interviewees (James 2006). First, as mentioned in section 3.1, several interviews, particularly those with *karung guni*, were carried out in languages other than English. In the course of translating the interviews into English, I have tried to keep true to the spirit of the spoken word according to the interviewees. Despite my best efforts, I acknowledge that some meaning is lost in translation. I have tried to overcome these issues by asking for assistance from friends who are native speakers of *Bahasa Melayu*, and were helpful in ensuring the accuracy of the translations.

Second, drawing on data gathered through interviews and field observations, I have sought to synthesise the data in a manner that allows for triangulation, and hence increase the validity and reliability of my arguments (Yeung 2003). By employing this strategy of analysing a given phenomena, I have been able to improve the rigour of arguments by understanding a particular social phenomenon/economic practice from the perspective of multiple actors.

Third, in recognition of the importance of each interviewee in my research, I have used verbatim quotes as far as possible to allow the interviewees to speak for themselves (James 2006). Verbatim quotes are accompanied by information such as the interviewee's occupation, and location of interview. This is significant in providing an appreciation of the perspective from which the interviewee is speaking, thus contextualising the responses (Smart 2009). Also, verbatim quotes reduce the potential for the researcher to misrepresent the opinions of interviewees (Latham 2003). In addition, in order to enhance the rigour of interpretations made, I have sought to include as wide a range of interviewees as possible in what follows, thus reducing reliance on a singular position or perspective.

## 3.5 Geo-Political Context

Through conducting a multi-sited case study on the regional e-waste recycling network in Malaysia and Singapore, a focus on the different strategies to ensure social reproduction by *karung guni* and the role of the state in each context emerged as a dominant theme. This is discussed in Chapter 6. Due to their common histories – dating back to the 1800s when Malaysia and Singapore were British colonies, to 1965 when Singapore was expelled from the Federation of Malaysia – Malaysia and Singapore remain closely inter-linked, yet distinct in many ways. Contemporary Malaysia and Singapore diverge politically, which has long-ranging impacts on their socio-economic policies. Keeping in mind that governments are key actors in the regional e-waste recycling network, it is thus fruitful to explore

the ways in which the unique geo-political situations in Malaysia and Singapore impact the articulation of the domestic e-waste recycling network with that of the e-waste recycling network at the regional/global scale (see Chapter 6). National contexts are thus important to the structure and development of the e-waste recycling network in each context. Rather than being just passive containers for economic and social activities to take place in, states are regulated by mechanisms and policies that can constrict and create opportunities for economic actors within their borders (Gereffi & Bair 1998; Bair 2005).

## 3.6 Conclusion

In this chapter, I have considered the research process adopted in this thesis. In particular I have looked at the way in which fieldwork was conducted, and how this influenced data collection. The methods of multi-sited case study, semi-structured interviews and field observations were examined, and their strengths and limitations were considered. This chapter also highlighted the importance of the multi-sited case study method in shedding light on the similarities and differences in the ways in which the e-waste recycling network in Malaysia and Singapore. In the next chapter, I examine the empirical context of the regional e-waste recycling network in Malaysia and Singapore through an analysis of four key aspects: (1) input-output structure; (2) chain governance; (3) global and national institutional contexts; and (4) territoriality/territorial embeddedness.

# Chapter 4

## Placing the E-Waste Question in Perspective

## 4.0 Introduction

In contrast to conventional mines which are often located in areas that are far removed from urban centres, and where the materials to be extracted are often buried deep underground, an 'urban mine' (Yamasue et al. 2008; Yamasue et al. 2009) is made up of waste that is produced in cities which can be collected and processed to satisfy the demand for raw materials of product manufacturing. The location of 'urban mines' can be landfills in cities or at the fringes of cities, or even in households, as seen in the case of consumers who keep their broken mobile phones in their drawers (Osibanjo & Nnorom 2008; Oguchi et al. 2011; Tengku-Hamzah 2011). The key to extracting precious metals from the 'urban mine' is the presence of an effective collection system (Hagelüken & Meskers 2012), and as I argue in the following chapters, this collection system is provided by *karung guni* in Malaysia and Singapore, and their labour is constitutive of the regional e-waste recycling network.

In spite of the dangers posed by the improper disposal of e-waste (e.g. increased rates of cancer and mortality, lead poisoning, soil and water pollution), several factors have resulted in e-waste being disposed of in an unregulated and unsanitary fashion that is far from the desired environmentally sound manner. The UNEP (2004b; 2006; 2012) highlighted these factors as lack of information and education of consumers, lack of facilities and infrastructure for proper waste disposal and collection, and lack of legislation, regulation and proper implementation in e-waste management (Leung et al. 2006; Zhang 2009; Chung &

Zhang 2011). In many countries e-waste is discarded together with regular household waste, and is thus deposited in landfills or incinerated without due regard for its highly polluting nature. These practices may lead to the possibility of lead poisoning and an increase in the number of stillborn babies (Makhoul 2003; Leung et al. 2006; Sepúlveda et al. 2010). Seemingly small amounts of e-waste in landfill sites can carry a relatively high amount of toxic chemicals due to often high concentrations of hazardous metals (Janz & Bilitewski 2008). The incineration of e-waste can cause dangerous effects through the release of chemicals into the atmosphere (Arlosoroff & Rushbrook 1991; Leung et al. 2006; Nnorom et al. 2011). The release of toxic gases such as dioxins, furans and hydrogen chloride can arise from the burning of flame retardants and chlorine elements in plastic (found in casings of electronic and electrical products). These toxic gases contaminate the air through smoke and dust and can potentially enter the human body through ingestion, inhalation and skin absorption (Mielke & Reagan 1998; Robinson 2009).

As well as being disposed of in landfills and incinerated, increasingly, e-waste is being recycled (Herat 2008; Schleup et al. 2009; Dwivedy & Mittal 2012; Herat & Agamuthu 2012; Hagelüken & Meskers 2012). Due to the hazardous and toxic nature of e-waste, the economic costs associated with operating an environmentally sound e-waste treatment and recycling facility are often very high, thus influencing many e-waste recycling businesses to seek cost savings. One possible avenue is through the export of e-waste to developing countries for processing where labour costs are largely cheaper, and where regulations are generally more lax (Hieronymi et al. 2012). Perceived as both providing employment to local communities and a lucrative opportunity for investment, e-

waste recycling in developing countries has become a burgeoning industry, and has triggered the growth of a complex network of international trade in e-waste (Huong 2009; Schleup et al. 2009; Lepawsky & McNabb 2010; Dwivedy & Mittal 2012; Kellenberg 2012). In this thesis, I uncover the labyrinthine relationships among actors in Malaysia and Singapore, with a particular emphasis on the ways in which the informal sector is tied up in these webs of (often illicit) e-waste trade.

Malaysia and Singapore share significant trade ties, hearkening back to the period when both were part of the Straits Settlements and Federated Malay States (a British protectorate) under the British Empire. Presently, Malaysia and Singapore are key members of the Association of Southeast Asian Nations (ASEAN), an organisation that seeks to promote trade within the region, economic growth and regional peace and stability (www.asean.org). The ASEAN Free Trade Agreement and the ASEAN Economic Community aim to improve intra-regional trade while promoting economic stability through trade with other countries including Australia, China, India, Japan and Korea (Hew & Soesastro 2003; Soesastro 2003; Green 2008; Sen & Srivastava 2009; Austria 2011; Basu Das et al. 2013; Chia 2013). These trade agreements are significant to the development and structure of the regional e-waste recycling networks in Malaysia and Singapore as they contribute to increases in the volumes of e-waste that are sent to Malaysia and Singapore for processing (see sections 4.3 and 4.4.1).

While many studies have paid attention to the export of e-waste from the US and the UK to developing countries, most notably China and Nigeria (see Cui & Forssberg 2003; Jofre & Morioka 2005; Babu et al. 2007; Nnorom & Osibanjo

2008a; Osibanjo & Nnorom 2008; Schleup et al. 2009; Shekdar 2009; Chibunna et al. 2010; Nnorom et al. 2011; Kellenberg 2012), this chapter examines the emerging trade in e-waste between Malaysia and Singapore, and analyses how these networks are linked to electronic product manufacturing in the region.

In this chapter I establish a contextual framework in order to situate the findings in the following chapters. Thus, the aim of this chapter is to position the arguments and findings of Chapter 5 and Chapter 6 within the dynamics of the regional e-waste recycling network, while also providing some background information to the processes occurring in the regional e-waste recycling network in Malaysia and Singapore. This chapter provides an overview of the e-waste networks in Malaysia and Singapore by identifying the key actors and the relationships among them. This chapter proceeds as follows: in the next section, I describe the input-output structure of the e-waste networks in Malaysia and Singapore, explaining the complex network of relationships among the various key actors. Following this, I analyse the chain governance of the network, addressing key issues on lead firms, practices of control, coordination and influence in the regional e-waste recycling network in the research sites. In section 4.3, I first analyse the role of international conventions and institutions in shaping the geographies of the international e-waste trade, and thereafter address the individual contexts in Malaysia and Singapore with regard to the relevant government offices and legislation that affects the management and trade in e-waste. Section 4.4 describes and interrogates the territoriality of the regional e-waste recycling network in Malaysia and Singapore, and how space and place matter to this complex geometry of relations, in particular to *karung guni*. Throughout this chapter, I draw on data

collected during fieldwork, especially interviews and field notes to support my arguments. The findings presented in this chapter form the bases for the analysis of value in the regional e-waste recycling production network (Chapter 5), and the articulations of the informal sector with the regional e-waste recycling network (Chapter 6). In this chapter, I argue that the regional e-waste recycling network in Malaysia and Singapore sheds light on the constitutive role of informal labour – in particular *karung guni* – through an analysis of the input-output structure of the e-waste recycling network (see Figures 4.1 and 4.2). In addition, I contend that chain governance is practiced in the form of coordination through industry standards and the activities of lead firms (particularly original brand manufacturers) who are the main consumers of recovered precious metals. With regard to institutional contexts, in section 4.3, I argue that global and national institutions shape the value creation, enhancement and capture opportunities of actors in the network through their regulation (or not) of e-waste. Moreover, in the case of national and local government, the regulation (or not) of the informal economy, particularly *karung guni*, has significant impacts on the value creation, enhancement and capture possibilities for this group. In section 4.4, I argue that the territoriality and spatial practices of *karung guni* has distinct repercussions for the value creation potential of *karung guni* (see also section 5.4.4). Taken together, this chapter employs the salient investigative tools of the GVC and GPN approaches to interrogate the regional e-waste recycling network in Malaysia and Singapore. Moreover, this chapter establishes the context for a more nuanced understanding of the findings and arguments in Chapters 5 and 6.

## 4.1 Input-Output Structure

In their introduction to *Commodity Chains and Global Capitalism*, Gereffi et al. (1994, p.8) ask the crucial question about the input-output structure of a chain: "But how do we know where GCCs start and where they end?… For instance, a manufacturing plant might be a central unit in the production network of a GCC, but this node may also serve as the end-point of the raw material supply network and as the starting point for the export network".

To answer this, they propose to "draw boundaries that capture those segments of GCCs that are functionally linked, not well understood, and for which good data can be obtained". In this section, I examine the input-output structure of the regional e-waste recycling network in Malaysia and Singapore, beginning with the source of e-waste, and ending with the e-waste recycling firms that process e-waste to extract and recycle precious metals. Importantly, I show that the input-output structure of the regional e-waste recycling network in Malaysia and Singapore enables an understanding of processes of value (re)creation which are explored in greater depth in Chapter 5. In addition, in mapping the input-output structure of the regional e-waste recycling network in Malaysia and Singapore, attention is also drawn to the constitutive role of geography and the territoriality of activities (see sections 4.4, 5.4 and 6.2). Indeed, the input-output structure and inherently spatial activities of *karung guni* and other e-waste actors in the regional e-waste recycling network in Malaysia and Singapore have distinct impacts on the potential for value creation, enhancement and capture.

Gereffi (1994, p.97) defined the input-output structure dimension of global commodity chains as "a set of products and services linked together in a sequence of value-adding economic activities". The e-waste recycling network in Malaysia and Singapore is marked by a set of relations of competition and cooperation that involve actors from both the formal and informal sector that rely heavily on social relations of mutual confidence and reliance (see section 5.3). Some of the cross border exchanges that occur involve unlawful transactions and are characterised by elements of illegality. Figure 4.1 illustrates the key actors and links in the e-waste recycling network in Singapore and Figure 4.2 presents the key actors and linkages in the e-waste recycling network in Malaysia. Of particular interest in the structuring of the input-output structure in Malaysia and in Singapore are the different spatial abilities of *karung guni* to collect and dismantle e-waste, thus having a direct impact on their value creation, enhancement and capture opportunities (see sections 4.4 and 5.4.4). In Malaysia, *karung guni* are often seen encountering other *karung guni* on their collection rounds, but because of the larger geographical area to collect e-waste from, conflicts between *karung guni* rarely occur. In addition, *karung guni* in Malaysia dismantle and sort their collected e-waste in their homes that often have spare rooms or areas to accumulate e-waste. This accumulation of e-waste allows Malaysian *karung guni* to negotiate higher prices when selling to e-waste wholesalers. In contrast, *karung guni* in Singapore operate within a set of norms that permits individual *karung guni* to have relatively equal access to the collection of e-waste. In addition, space for storage and hoarding of collected, dismantled and sorted e-waste by *karung guni* in Singapore is much less compared to their Malaysian-based counterparts, since

Singapore-based *karung guni* generally live in flats that do not afford them much spare space (see sections 6.3.1 and 6.3.4).

### 4.1.1 E-waste Recycling Network in Singapore

In this sub-section, and in 4.1.2 that discusses the e-waste recycling network in Malaysia, I draw on verbatim quotes from interview material that I gathered from fieldwork to describe the networks and support my arguments (see section 3.2).

The e-waste recycling network in Singapore (Figure 4.1) begins with e-waste that is collected from households and small businesses by three groups of actors: (1) *karung guni* who are itinerant and meander through the various housing estates in Singapore to purchase e-waste; (2) commercial e-waste collection firms who are paid a fee by the households and small businesses to collect e-waste; and (3) commercial public waste collectors who are required by their contracts with the town councils to collect recyclable waste from the households and small businesses that they collect municipal solid waste. Upon collection, *karung guni* dismantle and sort the e-waste components into working and non-working parts. Working parts are sold by *karung guni* to local electronic and electrical repair shops as replacement parts for spoilt equipment. Commercial e-waste collection firms and commercial public waste collectors sell their e-waste to wholesalers in Singapore, or to wholesalers who subsequently export the e-waste to Malaysia for further processing. Similarly, *karung guni* sell their non-working e-waste parts to e-waste wholesalers. E-waste wholesalers further sort the e-waste components and sell this to (1) partial recovery e-waste recycling firms;

**Figure 4.1: E-Waste Recycling Network in Singapore**

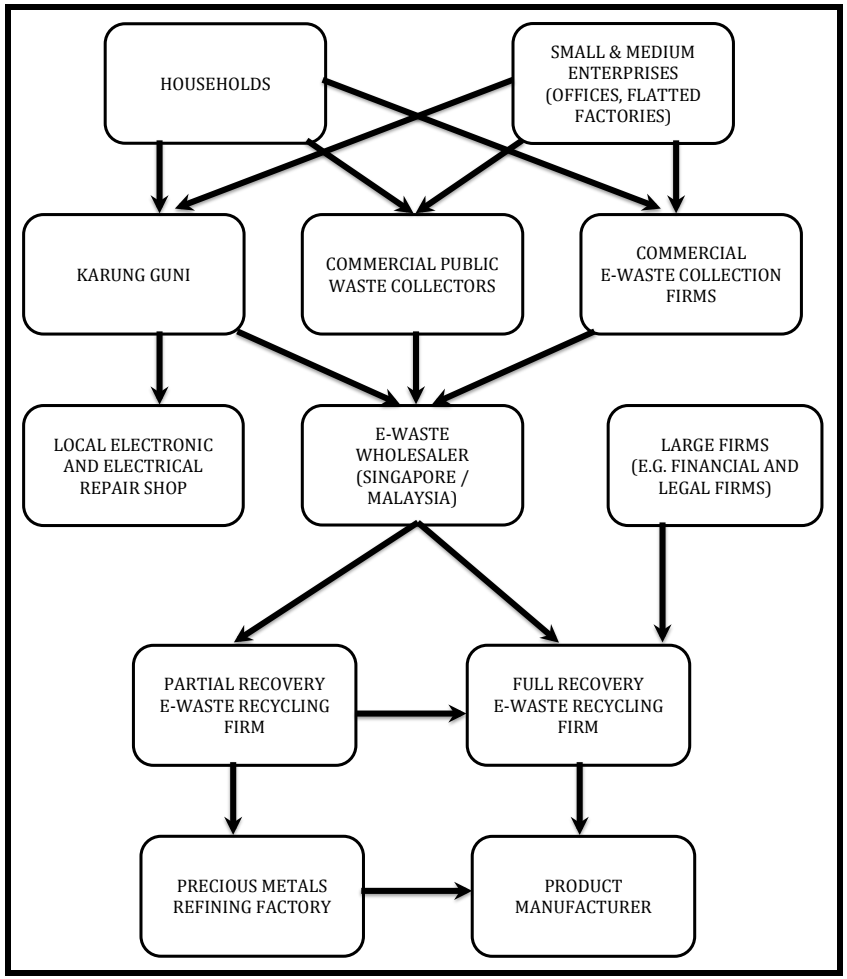
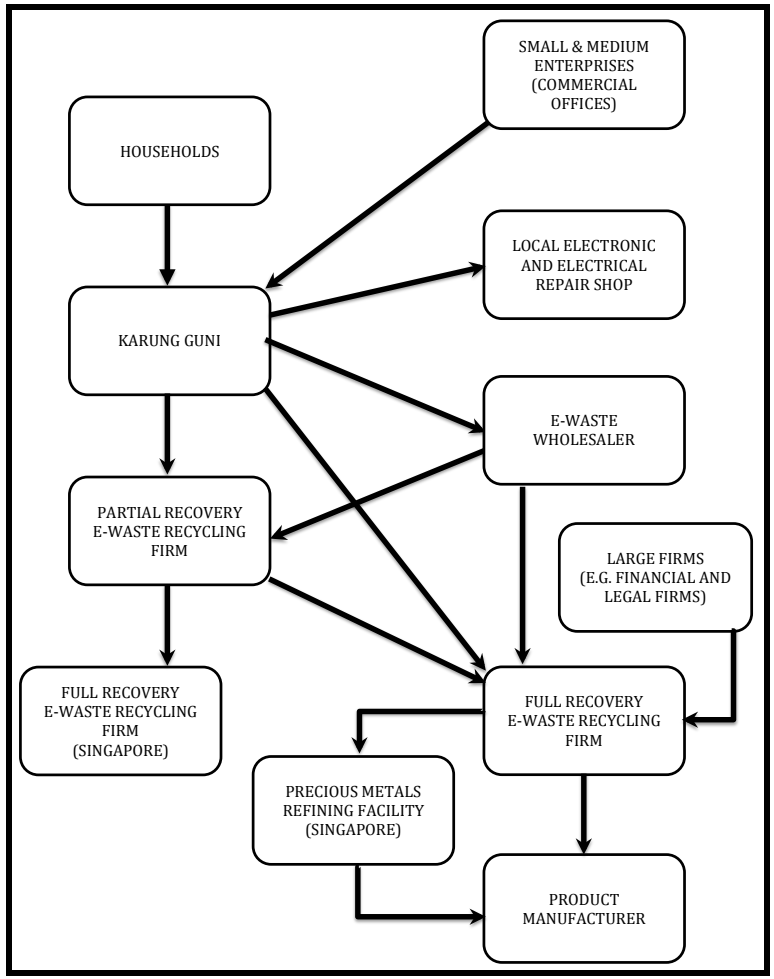



**Figure 4.2: E-Waste Recycling Network in Malaysia**



and (2) full recovery e-waste recycling firms. Partial e-waste recycling firms crush the e-waste components into pellets and melt it down to extract the precious metals. Often, the level of purity that they are able to achieve is insufficient for direct sale to product manufacturers. Hence, partial recovery e-waste recycling firms sell the recovered precious metals to a precious metals refining factory so that it can be further purified to meet the minimum requirements of product manufacturers. Full recovery e-waste recycling firms are equipped with the necessary technology and machinery to carry out the extraction and recovery of precious metals to standards that meet the technical demands of product manufacturers and are thus able to sell the recovered precious metals directly to them.

In Singapore, the e-waste network begins with the activities of *karung guni* who collect e-waste door-to-door on a regular basis (see Chapter 1). No geographical area is served exclusively by only one *karung guni*, and as such competition amongst *karung guni* has the potential to be very aggressive. For example, UKGSsgp #13 argued that he arrives at the first collection round location at around 7 o'clock in the morning to ensure that he is there before other *karung guni*, even though he only begins collecting an hour later. A similar argument was made by other *karung guni* in Singapore (UKGSgp #2, #7, #15, #17, #23; LKGSgp #2, #4, see also section 4.4). *Karung guni* collect e-waste from households and subsequently give those households an amount of money in return for their e-waste. PHResSgp #2 said,

> I have known *Ah Seng* [the name of the *karung guni*] for so many years already… [Its] not the first time I have sold him my spoilt appliances… He gave me ten [Singapore] dollars for the microwave oven. Last Chinese New Year he also took away my son's old computer… that one was very old, so we only got seven dollars.
>
> (Interview with PHResSgp #2, Singapore)

The exchange of goods for money, where e-waste is sold to *karung guni*, is different from that of the services provided by commercial e-waste collection firms and commercial public waste collectors. Commercial public waste collectors are required by Singapore legislation to provide recycling services to the households that they service. However, the reality of this recycling service is that they are generally reluctant to collect e-waste, and instead provide recycling bins in housing estates for the recycling of plastics, glass, papers, and aluminium and tin cans (see Figure 4.7). As a result, commercial public waste collectors in Singapore are not significant collectors of e-waste (MSWFSgp #1, #3, #4).

Small businesses, including commercial offices and flatted factories (light industrial factories which are located at the fringe of residential estates) also use the services of *karung guni*, alongside the services provided by commercial e-waste collection firms and commercial public waste collectors. While households in Singapore almost exclusively sell their e-waste to *karung guni* (PHResSgp #1, #2; MSFWSgp #1, #2; TCWCSgp #1), small and medium businesses engage the services of commercial e-waste collection firms on a regular basis, mainly due to the legal requirements for proper e-waste disposal especially when handling confidential data (SMESgp #1, #3, #4; FEWSgp #3; FRERSgp #4). However, this

legal requirement does not prevent small businesses from engaging the services of *karung guni*. For example, SMESgp #2 argued:

> We have legal obligations to ensure that data that we have on our clients… our client files, and all sensitive data requires that we use proper disposal methods to ensure nothing gets leaked out. We have a contract with [FRERSgp #2], but we still sell our stuff to *karung guni* when the chance comes along. Usually only our CPU is sent to [FRERSgp #2], sometimes only hard drive. Our printers, monitors, photocopiers, scanners, all go to *karung guni*…. At least with them [karung guni], I get some money back. With [FRERSgp #2], I have to pay…. And they are not cheap… We had to get quotations from them, and then wait to set appointments… A lot of hassle.
>
> (Interview with SMESgp #2, Singapore)

SMESgp #2's experience with commercial e-waste recycling firms is illustrative of the inconvenience often experienced by customers, which results in them engaging the services of *karung guni* instead.

*Karung guni* who have purchased e-waste from customers proceed to do one of two things. Either they bring it back to their homes and dismantle the electrical and electronic equipment into component parts, to be sold in bulk later when they have collected sufficient amounts of each component (for instance, several *karung guni* (LKGSgp #1, #4; UKGSgp #1, #4, #17, #24, #27, #33, #37) suggested that microchips are sold by the kilogramme), or they would take the electrical and electronic equipment to the Sungei Road market, a flea market, to sell it on to e-waste wholesalers. Either way, the next group of actors in the network after *karung guni* are e-waste wholesalers who purchase the sorted or unsorted e-waste

in bulk with the objective of selling it on to an e-waste processing firm for a profit. UKGSgp #39 illustrates some of the dynamics involved:

> I buy from homes, then I bring it all back to my flat. I don't have much space, so I usually only buy CPUs and laptops. The rest of the electrical and electronic equipment is too bulky and I don't have space to store all of it… Then during the night, or on days when I am not working, I sit at home and dismantle the equipment, and sort them into boxes… Then I sell to the wholesaler. Capacitors, microchips, motherboards, wires,… all kinds…. I don't go to Sungei Road. The reason is that I earn much more by dismantling and sorting and then selling by the kilogram the materials, rather than just sell a complete CPU to someone else.
>
> (Interview with UKGSgp #39, Singapore)

E-waste wholesalers purchase the sorted and occasionally complete unit of e-waste from *karung guni* and commercial firms in order to hoard the products in bulk before selling them on to e-waste processing firms. Hoarding them in bulk provides e-waste wholesalers with an opportunity to negotiate higher prices with e-waste recycling firms, and thus capture more value. Not all wholesalers are located in Singapore, as FEWSgp #5 notes:

> … the wholesalers in Singapore all are known to each other. But we also know there are some wholesalers from Malaysia who come to Singapore to buy e-waste and then make arrangements to transport to Johor or Melaka. Some *karung guni* also drive their lorries into Malaysia to sell there… happening for a long time already.
>
> (Interview with FEWSgp #5, Singapore)

Over the past decade, Malaysian e-waste wholesalers have become a common sight in the e-waste wholesale market in Singapore. The increase in Malaysian e-waste wholesalers sourcing for e-waste from Singapore is explained in two ways. First,

Malaysian e-waste wholesalers perceive Singapore e-waste to be of a higher quality compared to Malaysia where they reported experiences of purchasing microchips mixed with shredded tin cans (FEWKul #3, #4; FEWPng #2; IEWKul #1; IEWPng #1). Second, Malaysian e-waste wholesalers argued that Singapore is a convenient location for the purchase of e-waste to supplement their domestically collected e-waste when they are needing to fulfil orders from e-waste recycling firms in Malaysia (FEWKul #1, #2; FEWPng #1; IEWKul #2; IEWPng #3). In addition, FEWSgp #2 who has been in the business for almost eight years, opined:

> … they come from Johor or Melaka or even KL [Kuala Lumpur]. They buy here because they know there is always supply. Although they risk losing money because they can get caught for illegally importing to Malaysia,… they can make a lot of money if successful… the processing firms are willing to pay more in Malaysia, because the high-tech products supply is not as much as in Singapore.
>
> (Interview with FEWSgp #2, Singapore)

In Singapore, e-waste processing firms which purchase e-waste from wholesalers recover the precious metals and sell it on to product manufacturers according to pre-specified technical specifications. For e-waste that has been bought by Malaysian wholesalers, Malaysian-based e-waste processing firms purchase 'raw material' from wholesalers and extract the precious metals to sell on to product manufacturers, using either wet chemical processes and/or electrolysis (Awang 2010). However, there are occasions when the output of the e-waste processing firms is unable to meet the standards set by the product manufacturers, and as such, the e-waste processing firm sells the precious metals to a precious metals refining facility, which has the technical expertise and equipment to meet the

demands set out by the product manufacturers. PRERKul #1 explained this situation:

> After we have bought the e-waste from the wholesaler, we process it and try our best to meet the requirements as stated by the product manufacturer. This can be in terms of the dimensions,… whether they want it in ball bearings, sheets, or whatever. But we sometimes are unable to meet the exact specs [specifications], especially when talking about purity levels. Our usual way to meet this is to sell the product on to a precious metal refining factory in Singapore which has the technical know-how and machinery to satisfy the customer… We still manage to make a profit from this because the work we do separates a high percentage of waste from the precious metals.
>
> (Interview with PRERKul #1, Kuala Lumpur)

Contract product manufacturers who purchase recycled and recovered precious metals are mainly located in Asia, in particular India, China, Taiwan and Thailand (FRERSgp #1, #3, #4, #6, #8; PRERSgp #2, #3, #4). CtMfSgp #2 suggested that the demand for recycled precious metals is a worldwide phenomenon:

> … our company uses recycled precious metals because of our commitment to a greener environment. Our factories are located in China, Taiwan, India and Thailand. All of these factories have inputs which are recycled. We buy recycled metals from Singapore, China, Canada, US… anywhere. It does not matter to me as much where the recycled metals come from, … what matters is the quality and reliability of the supply.
>
> (Interview with CtMfSgp #2, Singapore)

The e-waste network in Singapore sheds light on the transactions and exchanges that occur across national boundaries, whilst highlighting the manifold relationships amongst various key actors across geographical space, for example between e-waste wholesalers in Malaysia and Singapore, and e-waste recycling

firms and product manufacturers in countries such as China, India and Thailand. Referring to Figure 4.1, in summary, e-waste is purchased from households and small businesses by *karung guni* who collect e-waste using hand-carts and goods lorries to aid in their collection activities. E-waste is also collected by commercial e-waste collection firms, and by commercial PWCs from small businesses. *Karung guni* dismantle, disassemble and sort the e-waste, and working components are then sold to local electronic and electrical repair shops as spare parts for faulty appliances. Non-working e-waste is sorted and then accumulated in sufficient amounts before being sold to e-waste wholesalers, some of whom are from Malaysia and export the sorted e-waste back to Malaysia for further processing. Singapore-based e-waste wholesalers purchase e-waste from *karung guni* and sell this to partial recovery and full recovery e-waste recycling firms, who recycle the e-waste and extract the precious metals to sell on to contract product manufacturers. Partial recovery e-waste recycling firms who are unable to extract or produce recycled metals to the specifications of contract product manufacturers, sell to precious metals refining factories who then manufacture to the requirements of contract product manufacturers. The input-output structure of the e-waste recycling network in Singapore sheds light on the various actors involved in these flows and the transactions that occur between actors. Beyond just an identification and description though, this particular analysis forms the foundation for an investigation of the (re)creation of value in the regional e-waste recycling network (Chapter 5), and also for the potential for actors in the network to create, enhance and capture value (sections 5.5 and 6.3). In the following section, I describe the e-waste recycling network in Malaysia and demonstrate the links that Malaysia and Singapore have in the processing of e-waste.

### 4.1.2 E-Waste Recycling Network in Malaysia

The e-waste network in Malaysia is configured differently to that of Singapore but still shares two features that are key to their operation. First, the informal economy is significant in the collection and initial dismantling and sorting of e-waste; second, there are still significant cross border flows of e-waste between Malaysia and Singapore. It is to the e-waste recycling network in Malaysia that I now turn.

Referring to Figure 4.2, in Malaysia, households and small businesses sell their e-waste to *karung guni*, who perform a similar function as their counterparts in Singapore. *Karung guni* dismantle, disassemble, sort and then sell working components to local electronic and electrical repair shops, and sell non-working components to e-waste wholesalers. In contrast to *karung guni* in Singapore, who sell directly to e-waste wholesalers, Malaysian-based *karung guni*, who often have greater access to storage, are able to accumulate sorted e-waste in sufficient volumes to sell directly to partial recovery and full recovery e-waste recycling firms. Full recovery e-waste recycling firms recycle e-waste and extract precious metals in a similar manner to their Singapore-based counterparts, and sell this to contract product manufacturers. Partial recovery e-waste recycling firms, if they are unable to produce precious metals to the specifications of contract product manufacturers, sell to e-waste recycling firms or precious metals refining facilities in Singapore (often as a result of better prices (PRERKul#2, #3; PRERPng #3, #5)) compared to selling to Malaysian-based facilities, or because Malaysian-based facilities are already operating at full capacity (FRERKul #2; FRERPng #3; PRERKul

#2, #4) and unable to process an increased volume, and these recovered precious metals are subsequently sold to contract product manufacturers.

In Malaysia, there is no formal or institutionalized system for managing household generated e-waste (Tengku-Hamzah 2011). This situation results in one of three scenarios: (1) that there is rampant dumping of e-waste on the outskirts of housing estates, where broken television sets, refrigerators and other electronic and electrical products are thrown on the wayside, which are subsequently picked up by *karung guni* who subsequently dismantle and sort the e-waste; (2) e-waste is purchased from the households by *karung guni*, who then dismantle and sort the collected e-waste to be sold on to e-waste wholesalers; or (3) where residents bring their e-waste to shops that on the outside declare that they are scrap metal dealers, run by self-employed recyclers but in fact deal with a gamut of e-waste (which they are not licensed to handle). The last scenario is not as common as the other two scenarios since it requires residents to transport the e-waste to the shops. Nonetheless, all three scenarios contribute to the flows of e-waste in Malaysia. KGPng #15 shared his experience of being in the e-waste recycling business for almost 12 years:

> There is no proper system to collect e-waste from homes. Sometimes, when driving around the city, if I see a discarded TV set on the road-side I will pick it up, bring it back to my shop and dismantle it. It is very common to see such household appliances lying around – TVs, VCRs, DVD players, fridges, sometimes even whole air-conditioning units. People just throw it by the roadside. I work on my own and for myself, so I know what items are bought most often by people in my trade. The items thrown on the roadside are often of low value to e-waste collectors, and we will only pay around RM 2 (≈ USD 0.60) for the VCR player. But the computers, laptops, … these items are worth much more, so people will bring it

> to my shop and ask for around RM 20 (≈ USD 6) or 30 (≈ USD 9) or even 50 (≈ USD 15).
>
> (Interview with KGPng #15, Penang)

Small businesses in Malaysia rely on the services of both the informal recycling industry and commercial e-waste contractors. When asked why they depended on the services of both *karung guni* and commercial e-waste collectors, small business owners gave similar responses to their counterparts in Singapore. SMEPng #2, alluded to a similar need for data protection to SMESgp #2, and said that:

> I bring my old computer to the shop, without the hard drive. The man knows it, and won't give me a good price, but at least I don't pay for it, and I get money back. The hard drive I just take a hammer and destroy on my own.
>
> (Interview with SMEPng #2, Penang)

In contrast to *karung guni* in Singapore, who often have limited space in their homes to store sorted e-waste and who would thus sell e-waste quickly on to wholesalers, 39 out of the 41 *karung guni* in Malaysia interviewed reported that they engaged in some strategy of hoarding, and attributed their ability to hoard their sorted e-waste for a longer time to space constraints being less restrictive in Malaysia (see section 6.3.8). In Malaysia, where land prices are significantly lower than in Singapore, many of my interviewees (35 out of the 41 *karung guni* interviewed) live in terraced houses, which have backyards or small plots of vacant land attached to their residence. A few Malaysian interviewees (KGKul #6, #14, #18; KGPng #5, #13, #15, #17) also shared that they have rented sheds where they stored their sorted e-waste. In contrast, *karung guni* in Singapore live

mainly in public housing flats, with an average of two bedrooms. The relatively more abundant availability of space in Malaysia affords Malaysian *karung guni* and informal sector scrap metal shop owners greater flexibility and ability to decide when they want to sell their sorted e-waste as they are able to store and hoard it until they find a price that is agreeable to them (i.e. a price offered by e-waste wholesalers for the sorted e-waste that is acceptable and fair to *karung guni* and e-waste scrap metal shop owners). The availability of space also allows them to hoard sorted e-waste in volumes that bypass the necessity to sell to an e-waste wholesaler, and sell direct to a commercial e-waste recycling firm (KGKul #1, #4, #7, #15, #18; KGPng #3, #5). This difference can be observed in the sale of microchips that are often sold by the kilogramme to wholesalers, but by the hundreds of kilogrammes to commercial e-waste recycling firms. In Malaysia, not all sorted e-waste is sold to the wholesaler, but is also sold directly to commercial e-waste contractors who engage in either full or partial recovery. KGKul #15 shared that who he would sell to was dependent on his cash flow,

> [I] must see how my money is. If short of money, I sell to the wholesaler, because I won't have enough for the contractor to want to buy from me. I lose money compared to selling to the contractor, but what to do? Depends on business, I sometimes get ten kilos of microchips in a month only. To sell to the contractor, you must have at least 1 tonne of microchips.
>
> (Interview with KGKul #15, Kuala Lumpur)

As mentioned in section 4.2.1, Malaysian-based e-waste wholesalers often also travel to Singapore to purchase e-waste and to import it back to Malaysia. It has been suggested that the quality of the sorted e-waste is better from Singapore.

FEWKul #2 who has been making trips to Singapore to purchase e-waste for five years, stated that:

> I make trips to Singapore about once every two weeks. The supply from Singapore is very reliable because the people in Singapore change their mobile phones and computers much faster than in Malaysia. And everyone in Singapore has one… sometimes two mobile phones. The sorted e-waste is also better… they are very careful when separating the components, and so you don't end up paying for materials that are not really meant to be there. There was once I bought a shipment of microchips from a scrap dealer in Penang, and I found about 20% was not microchips. This has not happened with what I bought from Singapore so far.
>
> (Interview with FEWKul #2, Kuala Lumpur)

Commercial e-waste recycling firms who carry out full recovery operations collect, segregate, dismantle, crush and extract precious metals to be sold on to product manufacturers according to the desired technical specifications. Partial recovery operations only collect, segregate, dismantle and crush, and rely on others for the smelting and further processing of e-waste to extract the precious metals. With the number of partial recovery facilities in Malaysia being higher than full recovery recycling firms, the full recovery facilities who take on the secondary role of processing e-waste from partial recovery facilities are often operating at their maximum operating capabilities, and have been known to turn away customers. Malaysian partial recovery firms often turn to Singapore-based firms to process the sorted and crushed e-waste. FRERPng #3 opined:

> There are times when I just simply cannot take on any more from the partial recovery people. I want to buy from them, but I have no warehouse space to store or I don't have more machinery to deal with the increased volume. I know I miss opportunities there, but unless I expand, there are times I just cannot.
>
> (Interview with FRERPng #3, Penang)

However, this was not the only reason for partial recovery firms to sell their sorted and crushed e-waste to Singapore-based firms. PRERKul #1 preferred to sell to Singapore-based firms in spite of the risk of problems in exporting the material to Singapore for processing:

> I will approach the ones in KL, in Penang. If they don't want, then I go to Singapore… I think selling to Singapore companies is better because they are more honest,… the price is always better. The price they buy from me is also in Singapore Dollars, which is better than over here, where I get Malaysian Ringgit. I can even ask for payment in US Dollars if I want. The ones in Singapore never turn me away… but I do have the risk of having the shipment stopped by Singapore Customs. I usually label it as mixed scrap metal, but once I lost money because the shipment got detained by the customs police.
>
> (Interview with PRERKul #1, Kuala Lumpur)

In the course of fieldwork, it was found that full recovery recycling firms – two in Penang, and one in Kuala Lumpur – have subsequently sold their extracted precious metals to precious metals refining facilities in Singapore. This was done as a result of these full recovery recycling firms in Malaysia having machines that recovered precious metals with significant amounts of impurities present.

In this section, I have presented a description of the network of linkages between actors in Malaysia and Singapore in the regional e-waste recycling network and

demonstrated the intimately interlaced relationships amongst the key actors. The analysis of Figures 4.1 and 4.2 has demonstrated three key points. First, an identification of the network of key actors and the relationships empirically situates the relationships and exchanges that are discussed in Chapters 5 and 6. Second, there is significant movement of e-waste (at various stages of processing) between Malaysia and Singapore, thus highlighting the interlinked nature of the e-waste recycling networks in these two territories. Third, the geography and spatiality of the activities of the actors in the networks examined have significant impacts on their ability to create, enhance and capture value from e-waste recycling.

The input-output structure discussed in this section demonstrates the social relations that enable the recycling of e-waste (validation of value through exchange, see Chapter 5). These social relations form the foundation for the value creation and value capture potentials of each of these actors at each stage of the regional e-waste recycling network. These network formations, which are distinct in different settings according to the demands laid out by contract product manufacturers – who are the downstream consumers – coupled with the capabilities of the actors in meeting these standards, have significant impacts on the capture of value by the various upstream actors. As will be discussed in Chapter 5, the structure and relationships of actors in the regional e-waste recycling network have profound effects on the ability of actors to create and capture value. In the next section, I examine the chain governance of the regional e-waste recycling network. I argue that an understanding of chain governance is important as it identifies the key actors who control and coordinate the network,

and who determine the distribution of value creation, enhancement and capture opportunities by other actors in the chain.

## 4.2 Chain Governance

An analysis of the key actors and their relations with one another illuminates an important dimension to the e-waste network – that of chain governance by shedding light on the power asymmetries among economic actors (both firm – such as e-waste recycling firms and contract product manufacturers – and non-firm – in particular *karung guni* – actors) in the regional e-waste recycling network. These power asymmetries highlight the ability of actors to control and coordinate the chain to their advantage, while impacting the value creation, enhancement and capture opportunities available to other actors. In addition, an understanding of chain governance is important as it unpacks the upgrading possibilities and potential of actors in the network, which are linked to the value generation capacities of actors. In this section, I argue that chain governance in the regional e-waste recycling network in Malaysia and Singapore is exercised in the form of control and coordination, most notably by original brand manufacturers. Importantly, in this section I argue that *karung guni* are crucial to the regional e-waste recycling network in Malaysia and Singapore through their collection, dismantling and sorting of e-waste. Yet, even though *karung guni* are central to the chain, their ability to extract value is limited.

Chain governance in the regional e-waste recycling production network in Malaysia and Singapore is comprised of relationships with varying degrees of power asymmetry at different stages. Indeed, the inter-firm linkages among actors within Malaysia and within Singapore, as well as the relations among firms in Malaysia and Singapore are very similar (for example in the relationships between e-waste wholesalers and e-waste recycling firms, and local repair shop owners and *karung guni*). There are however differences (for example in the ability of *karung guni* to hoard e-waste or to have a stronger position in price formation) that may be related to the effects that different national-level institutional contexts and spatial constraints have on the exchanges within the network. Undoubtedly, the demand for recycled precious metals is driven by the requirements of contract product manufacturers who manufacture components and equipment for original design manufacturers and original brand manufacturers of electronic and electrical goods. In this sense, original brand manufacturers exercise a significant amount of power over this segment of the regional e-waste recycling production network. Although this organisational structure in this chain may fit into Gereffi's (1994) ideal-type of a buyer driven commodity chain with its emphasis on first-tier suppliers and buyers, it fails to take into account how the power exercised by original brand manufacturers may be experienced by non-firm actors, including *karung guni* and households who are the initial sellers of e-waste (see critique in section 2.1.2). Hence, instead of drawing on Gereffi's ideal-type of governance, I have chosen to draw on a descriptive and theoretically informed analysis of chain governance in this section to argue that these relationships are formative of the value creation, enhancement and capture potential of actors in the network.

Referring to Figures 4.1 and 4.2, in the first stage of this segment of the regional e-waste recycling network, there is the exchange between households and small businesses on the one hand, and *karung guni* on the other. The degree of explicit coordination and power asymmetry between *karung guni*, and households and small businesses, is low, since the costs related to switching suppliers remains low. In this sense, *karung guni* are free to purchase e-waste from a range of households and small businesses, as are households and small businesses relatively free to sell their e-waste to a myriad of *karung guni*. However, relationships of familiarity built over repeated transactions may lead towards these exchanges persevering over time. In the case of more than 90% of the 46 *karung guni* in Singapore involved in this research, and around 80% of the 41 *karung guni* in Malaysia, they reported that they had established relationships with many households and small businesses which they service, thus ensuring that they would be the "preferred" *karung guni* to whom specific households and small businesses would sell their e-waste. It would be difficult to decipher if *karung guni* or households and small businesses exercise greater influence at this stage of the regional e-waste recycling network, since both *karung guni* and households and small businesses are in what is essentially a symbiotic relationship, whereby *karung guni* are seeking to establish a steady supply of e-waste, while households and small businesses benefit by ensuring they have – in the form of *karung guni* – a removal and disposal service for their e-waste.

With reference to Figures 4.1 and 4.2, in the second stage, *karung guni* sell disassembled and sorted e-waste to (1) local electronic and electrical repair shops; (2) e-waste wholesalers; and (3) e-waste recycling firms. Between *karung guni* and

local electronics and electrical repair shops, *karung guni* are free to sell the working parts of e-waste to repair shops of their choosing. The level of power asymmetry is low, with *karung guni* being in a more advantageous position to make two decisions. First, *karung guni* have to decide whether they will earn more money selling the working components to local repair shops or as sorted e-waste. Second, even if they decide to sell the working components to local repair shops, *karung guni* have the ability to decide which local repair shop they want to sell to since they are not in any obligated relationship to sell to a specific local repair shop owner. Nonetheless, repair shops rely on *karung guni* as their sole suppliers of cheap working parts of sometimes obsolete components (EERpSgp #1, #2, #3, #4; UKGSgp #2, #5, #8, #14, #19, #22, #35). UKGSgp #5 underscored the dependence of local electrical and electronics repair shops on *karung guni*:

> I sell them the working parts, and they benefit by having access to otherwise difficult to find components. Many of these parts that they want are already not produced anymore. But I also depend on them, because the working parts have a better price than the non-working parts, so I get more money.
>
> (Interview with UKGSgp #5, Singapore)

In a similar manner, *karung guni* and e-waste wholesalers are in a relationship where both groups of actors are free to trade with actors of their own choosing although the power asymmetry between them is more pronounced than that between *karung guni* and repair shops. In this inter-actor linkage, e-waste wholesalers have a greater influence over this stage of the chain than do *karung guni*, and are able to influence price formation through their individual buying practices. Although *karung guni* are free to sell to any e-waste wholesaler they are

able to negotiate a mutually agreeable price (defined as a price that broadly satisfies the goals of both parties) with, the party who dictates the opening price in these negotiations is often the e-waste wholesaler, and e-waste wholesalers are also generally acutely aware of their relative influence over *karung guni*, mainly because *karung guni* are motivated to complete the sale rapidly due to their limited financial resources. In addition, the number of e-waste wholesalers is significantly smaller in number than the number of *karung guni*, thus resulting in a situation where *karung guni* are limited in the number of alternative e-waste wholesalers they may sell their sorted e-waste to. All 11 e-waste wholesalers in Singapore, and 12 out of 14 e-waste wholesalers in Malaysia argued that they had no experience of *karung guni* in the past year refusing to sell e-waste to them after a period of negotiation, and the price which was finally agreed was closer to that which the e-waste wholesalers set out rather than that which *karung guni* initially asked for. For the other two e-waste wholesalers in Malaysia whose offers had been rejected by individual *karung guni* in the past year, they stated that these occurred only because *karung guni* were asking for prices that were significantly more than what any other wholesaler would be willing to pay. In these cases, the two e-waste wholesalers further told me that the *karung guni* in question were hoarding their e-waste, and were thus trying to get a higher price by selling a larger volume. Indeed, e-waste wholesalers exercise a greater influence over this stage of the chain, and yet are still reliant on *karung guni* for a steady supply of e-waste, since e-waste wholesalers themselves do not do any collection, dismantling or sorting work themselves.

Referring to Figure 4.2, in their transactions with e-waste recycling firms, Malaysia-based *karung guni* are in a relationship where they are in a relatively weaker position. *Karung guni* sort and bundle e-waste into sufficient volumes for direct sale to e-waste recycling firms, thus circumventing the e-waste wholesaler (vis-à-vis Figure 4.1). Nonetheless, this option of selling directly to e-waste recycling firms is an option that is limited by the financial resources available and the space constraints of individual *karung guni* (for this reason, direct sales to e-waste recycling firms is observed in Malaysia, but not in Singapore, see also section 4.4). At this stage, the power asymmetry lies in favour of e-waste recycling firms who heavily influence price formation, and exact demand specifications on *karung guni*. FRERKul #1 argued that his firm's practices of purchasing directly from *karung guni* was an effective solution to lowering costs, but yet was an unsustainable option since *karung guni* did not always have the ability to meet his firm's demands:

> I buy from them [*karung guni*] at a lower price than what I pay e-waste wholesalers, so I save money. But they also gain, because I pay more than what e-waste wholesalers will pay them. It's win-win for both of us… But I am very specific about what I want. When I say I want only copper wires, I don't want other materials inside. I am very careful to make sure that they [*karung guni*] sell me what I want, not what they are trying to get rid of… But buying directly from *karung guni* is not common, only once or twice a month. I still buy most from e-waste wholesalers.
>
> (Interview with FRERKul #1, Kuala Lumpur)

With regard to the relationships presented in Figures 4.1 and 4.2 between wholesalers who sell e-waste in bulk to recycling firms, in this inter-firm linkage, recycling firms are in a stronger position to control the chain compared to

wholesalers. Wholesalers often source for specific e-waste materials after receiving an order from e-waste recycling firms, for example copper wires, and/or printed circuit boards. Rather than receiving payment from recycling firms as an advance payment for the e-waste, wholesalers purchase sorted e-waste with their own capital, and produce sorted e-waste in bulk to the specifications of recycling firms when an order is received. For example, e-waste wholesalers aim to meet the volumetric requirements and other specifications of e-waste recycling firms. The lead firm in this stage of the network is the recycling firm who is able to capitalise on general e-waste industry standards that affords it the freedom to source for bulk e-waste from a selection of wholesalers. FEWPng #2 argued that he packages e-waste according to the requirements of his customers (e-waste recycling firms), and this is often in bales of different volumes:

> I have two machines to compress the e-waste into bales of varying sizes, according to what e-waste recycling firms want to buy from me. This allows me to have a few customers, since I am able to meet different demands and requirements. Right now I have about five regular e-waste recycling firms who buy from me, but money is tight since I have to make all the initial payments, and hope that customers don't cancel the order.
>
> (Interview with FEWPng #2, Penang, Malaysia)

Looking again at Figures 4.1 and 4.2, at the next stage of the regional e-waste recycling network under examination, the relationship between e-waste recycling firms and contract product manufacturers is marked by power asymmetry in favour of contract product manufacturers. In this sense, contract manufacturers or original equipment manufacturers give detailed technical specifications to e-waste recycling firms with regard to the dimensions, shapes, purity and other

requirements that they have for the recycled precious metals. E-waste recycling firms invest in machinery and processes that allow them to recover the highest volumes of precious metals from e-waste, while also investing in machinery that produces the output according to the general demands made by contract manufacturers who are their customers. The ability to meet different demands according to size, shape, dimension and purity provides e-waste recycling firms with the flexibility to fulfil orders from a range of customers. In addition, the use of generic machinery that is able to meet the requirements of a range of product manufacturers prevents e-waste recycling firms from being dependent on the demand requirements of a singular contract manufacturer. However, a power asymmetry that benefits contract manufacturers is dominant at this stage. Contract manufacturers are able to make orders for industry standard recycled precious metals outputs from a range of e-waste recycling firms, and are not tied down to the outputs of any singular e-waste recycling firm. Industry standards, as pointed out in section 2.1.2, are a form of governance that is beneficial to both buyers and suppliers since suppliers are able to sell to a wider range of buyers, while buyers are able to switch between suppliers with little disincentive. In this sense, the power asymmetry in this chain emanates out from product manufacturers, following decreasing levels of concentration and capitalisation, or what has been termed the "cascade effect" (Nolan et al. 2008; Nolan & Zhang 2010).

Nonetheless, e-waste recycling firms have another market to which they can sell their recycled precious metals – the international metals trading market. In this case e-waste recycling firms place themselves at the vicissitudes of the metals

trading market, but yet are able to use this as a means of increasing the likelihood of a sale. FRERPng #1 argued that the international metals trading market was his means of selling occasional excess volumes of recycled precious metals:

> …we sell to contract manufacturers here in Malaysia, or Thailand, or India or China. Those I make a good profit, but then I need to put in a lot of design changes and I need to adjust the system to produce the output according to individual requirements. What is leftover, or when I know there is profit to be made by buying cheaply from e-waste wholesalers,… I produce to the specifications and requirements of the metals trading market. This is easier, but it means that I have to be prepared to wait for someone to want to purchase at the price I am willing to sell at, which means that my cash flow is not as quick. The turnover is more unpredictable. But it is still good.
>
> (Interview with FRERPng #1, Penang)

Ultimately though, contract manufacturers and original equipment manufacturers are in inter-firm linkages with original brand manufacturers (OBMs) who yield the overall control and coordination of the chain. Most relevant to this thesis is the usage of recycled precious metals in the manufacturing process. Of the six original brand manufacturers interviewed in Malaysia and Singapore, four of them (OBMSgp #1, #2; OBMPng #1, #2) highlighted specific percentages of recycled precious metals that were to be used as input into their products, whilst the other two (OBMSgp #3, #4) said that they were aiming to increase their usage of recycled precious metals gradually, but that they had already begun using recycled precious metals in their production, albeit in small percentages. In this sense, original brand manufacturers control and coordinate the demand for recycled precious metals through their manufacturing requirements, often in an effort at product differentiation (see Chapter 5).

In this section, I have analysed the various stages of the regional e-waste recycling network in Malaysia and Singapore, and argued that chain governance illuminates the power asymmetries between the different actors in the network. Significantly, this asymmetry has distinct impacts on the value creation, enhancement and capture potentials of these actors.

In the next section I look at the international and national regulatory institutions that influence (or not) the functioning of the network, and highlight their significance towards understanding the e-waste network in Malaysia and Singapore. Through an examination of global and national institutions, I argue that these institutions have a constitutive role in the regulation (or not) of the e-waste recycling network in Malaysia and Singapore, and this has the effect of structuring the dynamics of the network, thus shedding light on the potential for value and wealth generation for different actors in the network. In addition, I argue that national institutions are pivotal in the network through their social policies to bolster the continued articulation of informal labour in the regional e-waste recycling network. Importantly, sections 4.2 and 4.3 contend that informal labour is central to the whole process of e-waste recycling in Malaysia and Singapore through their activities of collecting, dismantling and sorting e-waste.

## 4.3 Global and National Institutional Contexts

Gereffi (1994, p.100) recognised the role of state policies and institutions in structuring the organisation of global commodity chains, and emphasised the importance of state policies towards economic development. In a similar way, Gereffi et al. (2005, pp.98-99) argued that "local and national structures and institutions also matter… [and] [i]t is also clear that global-scale regulations, the 'rules of the game' as it were, have a profound effect on the shape and direction of change in global value chains." Moreover, Smith (2014, pp.1-2) recognised

> the very significant role that state action at international, national and subnational scales plays in the formation, constitution and restructuring of the position of firms, capital and labour in global production networks, including policies for national economic competitiveness, industrial policy, trade policy, labour regulation, and so on.

In the spirit of understanding the role of national and international institutions in the organisation of the regional e-waste recycling network, this section examines the institutional contexts that this segment of the regional e-waste recycling network in Malaysia and Singapore is embedded within. In this section, I argue that while legislation and regulations exist in principle, the practice of enforcing the law (i.e. the day-to-day administration of the law), has fallen short of the expectations of these measures, and in effect, has on the one hand, passively permitted the continued existence of illegal trade in e-waste across national borders, and on the other, facilitated the trade in the informal economy and encouraged underground practices. This divergence in principle and practice has had profound effects on the organisation of the regional e-waste recycling network

in Malaysia and Singapore, as it has enabled the continued transboundary movement of e-waste. In addition, national legislation and regulation (or not) of the informal economy has direct impacts on the informalisation of the e-waste extraction process, for example in the ability of *karung guni* to carry out their collection, dismantling and sorting of e-waste in a relatively uninterrupted manner. In effect, national legislation and regulation (or lack thereof) of *karung guni* reinforces the central role of *karung guni* in the recycling of e-waste in Malaysia and Singapore. Whilst legislation restricting the transboundary movement of e-waste exists, in practice, such measures have had little effect in curbing or terminating the movements altogether, and have had little effect on the structure of the regional e-waste recycling network. However, the state is not limited in its role to just being a regulator. In section 4.3.3, I discuss the importance of different state policies in Malaysia and Singapore enabling social reproduction through subsidies (housing and utilities) and a comprehensive pension system; and its regulation (or lack thereof) of informality. These aspects of the state have distinct impacts that both impinge on and create the conditions that influence the ability of *karung guni* to operate within the regional e-waste recycling network.

The trade in e-waste amongst developed and developing countries increased significantly in the late 1980s and early 1990s, and continues even to this day, in spite of the ratification of the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (henceforth, Basel Convention) by 179 states and the European Union (Wilson et al. 2006; Nnorom & Osibanjo 2008a; Nnorom & Osibanjo 2008b; Osibanjo & Nnorom 2008; Zoeteman et al. 2009; Nnorom et al. 2011; Hieronymi et al. 2012; Kahhat & Williams 2012). Figure

4.3 illustrates the major flows of e-waste in Asia, and presents Malaysia and Singapore as main ports where e-waste is received from Europe and Australia and dispatched to the rest of Asia. In addition to being major transhipment ports, Malaysia and Singapore are also major producers and recyclers of e-waste (see also Connolly 2012). Figure 4.4 identifies OECD countries as the major producers of hazardous waste, and indicates European exports of electronic waste, cable waste and plastic waste as the main flows to Asia. Interestingly, Singapore has GDP per capita levels that are similar to that of OECD members and is portrayed benignly as "states or regions where illegal waste dumping has been proven" (UNEP 2006, pp.36-37). Counter to this portrayal, I argue that Malaysia and Singapore are significant producers of e-waste, and are indeed complicit in the transboundary movement of e-waste.

In Figure 4.3, the UNEP has identified the key transhipment sites through which e-waste is transported. Besides the commonly acknowledged ports in the Indian subcontinent (such as Mumbai, Ahmedabad, Madras and Karashi), and in China, of particular importance to this thesis is Singapore's role in the global transhipment of e-waste. According to Figure 4.3, Singapore receives e-waste from Australia, North America, Japan, Europe, and exports e-waste to India and China, and as this thesis has uncovered, to Malaysia as well.

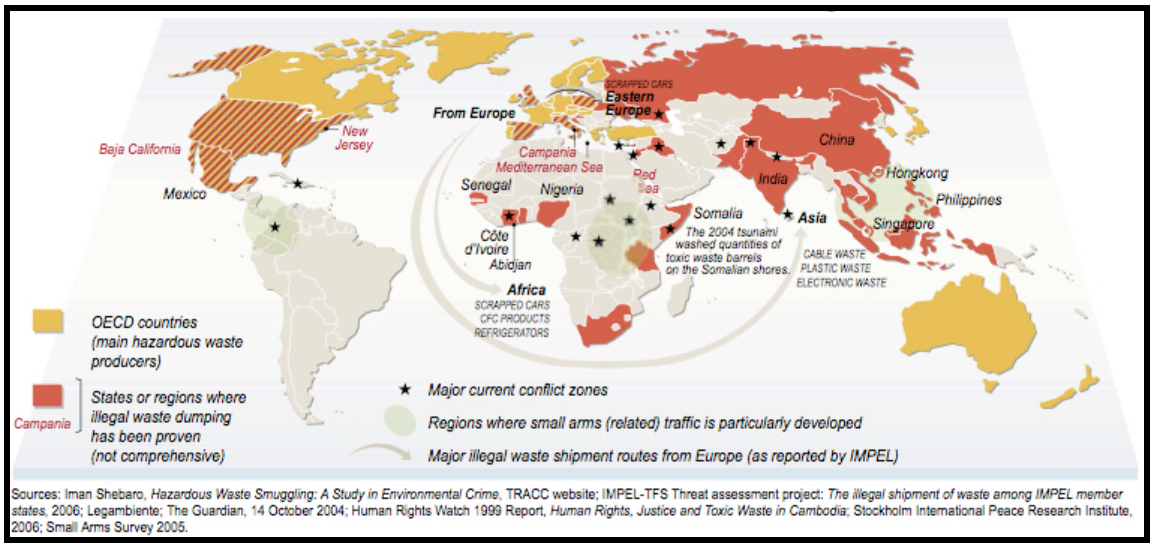
In Figure 4.4, the UNEP (2006, p.36) has identified the Southeast Asian region as a territory "where illegal waste dumping has been proven", shedding light on the importance of Southeast Asia, and in particular, Malaysia and Singapore, as sites where cable waste, plastic waste, and electronic waste are illegally disposed of. A

conclusion that is drawn from these two figures is that in spite of global and national institutions enacting legislation and regulation (or not) aimed at controlling the transboundary trade in e-waste, the illegal export and import of e-waste persists.

**Figure 4.3: Who Gets The Trash?**


Source: UNEP (2006)

**Figure 4.4: Trafficking Waste Stories**




Source: UNEP (2006)

In response to the rapid growth of e-waste exports to developing countries (discussed in Chapter 2), and the concomitant potential damage to the environment and human health, the Basel Convention (www.basel.int) was adopted under the auspices of the UNEP in 1989 and came into force in 1992. As the key international agreement on the management of hazardous waste, in particular e-waste, the Basel Convention, through its regional offices across the globe, influences government policies by publishing reports on the current state of hazardous waste management and monitors the international flows of hazardous waste, while paying close attention to the effectiveness of national governments in meeting their commitments to the Convention. Whilst Malaysia and Singapore are both signatories to the Convention and have passed legislation regarding the import and export of hazardous wastes in accord with the Convention, the Basel Convention has been largely unsuccessful in regulating the global movement of hazardous waste (Kummer 1992; Clapp 1997; Choksi 2001; Massari & Monzini 2004; Liddick 2010), as demonstrated by the high volumes of illegal trade between

Malaysia and Singapore (Lundgren 2012), and indeed the rest of the world (UNEP 2006). GvtMys #1 argued that monitoring the import and export of e-waste is challenging:

> Controlling the flow of e-waste? … We only catch around five to ten percent of what is illegally imported or exported. It is impossible to control trafficking entirely. We have all the necessary forms and declarations and paperwork, but so what? We can't even monitor the amount of e-waste produced in Malaysia and exported elsewhere… what more of the amount that is imported! In to Malaysia, out of Malaysia… Singapore, China, Taiwan, Thailand, Indonesia, South Korea, Japan, Australia, India, Vietnam…There are so many failures to the monitoring.
>
> (Interview with GvtMys #1, Putrajaya)

Undoubtedly, the practice of monitoring the movement of e-waste is a challenge that states are not all equipped to address. The global trade in e-waste takes advantage of large informal sectors, lax government regulation or situations where government capacity is lacking, and, as has been studied extensively in China and India, thousands are engaged in the illegal recycling of e-waste, often working in dirty and dangerous conditions (Leung et al. 2006; Liu 2006; Bandyopadhyay 2008; Zhang 2009; Sepúlveda et al. 2010; Dwivedy & Mittal 2012). The Basel Action Network (Puckett et al. 2002) suggests that 50-80% of e-waste from industrialised countries is exported, mainly to China and India, for cheap recycling and final disposal due to the lower labour costs and less stringent environmental regulations. Nnorom and Osibanjo (2008a, p.1474) suggest that the trade in e-waste to the Global South may also be seen as a donation to "bridge the digital divide". Yu et al. (2010) documented similar findings in their analysis of the import of e-waste into China and the practices surrounding e-waste trade.

The informal sector often employs very crude ways of disassembling, dismantling and processing e-waste, often involving acid baths (whereby printed circuit boards are soaked in a solution of sulphuric and nitric acid) to separate the metals from the plastic components, and the open flame burning of wire cables to melt away the plastic casings and thus recover the copper wires inside. However, the importance of the informal sector in e-waste recycling and processing is not limited to only China and India, but is seen across the globe, and arguably includes the informal sector in Malaysia and Singapore (Masocha 2006; Chi et al. 2011; Oguntoyinbo 2012; Katusiimeh et al. 2013). Although often criminalised by the Basel Convention as a maelstrom of illegal activities that needs to be regulated and controlled lest they cause further environmental harm, the informal sector remains irrefutably central to the continued existence of the global e-waste recycling industry (see Chapter 6).

### 4.3.1 Basel Convention

According to the definition of 'hazardous waste' in Article 1 of the Basel Convention (www.basel.int), 'hazardous wastes' are:

a) Wastes that belong to any category in Annex I, unless they do not possess any of the characteristics contained in Annex III; and
b) Wastes that are not covered under paragraph (a) but are defined as, or are considered to be, hazardous wastes by the domestic legislation of the Party of export, import or transit.

The waste streams and waste constituents from Annex I of the Basel Convention are listed in Appendix 4. Of particular note in this table are the various metals that

are commonly found in e-waste. Annex III of the Basel Convention (Appendix 4) shows the hazardous characteristics of materials that would place them immediately under the purview of the Basel Convention. These characteristics include materials that are explosive, flammable, liable to spontaneous combustion, or which are corrosive. However, material constituents in Annex I, if they do not exhibit the characteristics of Annex III, are excluded from the Basel Convention. This creates a loophole in the system, since the dismantling of e-waste into component parts allows for the more toxic (or the components that are defined to be hazardous) to be separated from the toxic components, thus making them permissible for export/import. [4]

Countries that are participants in the Basel Convention are required to submit their national definitions of 'waste' and 'hazardous wastes' to the Secretariat (Basel Convention, Art. 1(b)). As such, countries are given a certain amount of autonomy in determining whether they would prefer to widen or narrow the scope of the general definition as set out by the Basel Convention. An example of this would be definition of 'waste' itself. According to the Basel Convention Fact Sheet, Singapore defines 'waste' as

> a substance or object that is proposed to be disposed of; or required by any written law to be disposed of (Basel Convention Fact Sheet 2011a).

In contrast, Malaysia's definition is far more specific, stating that:

[4] Annex I has specifications for the control of the movement of several everyday products. Annex III specifies the exact characteristics that materials must possess to be classified in Annex I; if they do not fulfil any one of the stated characteristics, they are considered to be outside the consideration of the Basel Convention.

> [w]aste is defined as any matter prescribed to be scheduled waste or any matter whether in a solid, semi-solid or liquid form, or in the form of a gas or vapour, which is emitted, discharged or deposited in the environment in such volume, composition or manner as to cause pollution (Basel Convention Fact Sheet 2011b).

The difference in definitions brings to the fore two key issues that have significant ramifications for the effectiveness of the Basel Convention. First, by employing different definitions, different countries report different levels of hazardous waste generation, export and import to the Basel Convention Secretariat. This results in ineffective monitoring of which countries are producing more or less waste per capita. The lack of standardised data results in difficulties in estimating the levels of illegal movements of hazardous wastes. Second, the definitional differences allow some states to police more stringently their borders with regard to the import of hazardous waste, while enabling other countries with looser definitions to be relegated to the status of 'waste havens' (Williams et al. 2008; Hieronymi et al. 2012). Looser definitions also enable some countries to export hazardous waste without the need for declarations to the Basel Convention. The flexibility and fluidity in definitions thus permits countries to trade in e-waste. In essence, the lack of a common definition by all member states results in a general inability to enact rigorous regulation of the transboundary flows of hazardous waste, in effect crippling the spirit of the Basel Convention.

Despite the many efforts by signatories of the Basel Convention to address the trade in e-waste, after two decades the illegal trade in e-waste continues to exist, with significant implications for places that process it. Several researchers have

attempted to analyse the continued widespread transboundary movement of e-waste in spite of an international treaty to address the problem. Streicher-Porte et al. (2005) and Widmer et al. (2005) argue that the impasse is related to lack of implementation of national regulations and weak enforcement of law in member countries. Similarly, Lepawsky and McNabb (2010) identify three gaps in the Basel Convention that have resulted in its ineffectiveness in addressing the global illegal trade in e-waste: first, the contradiction in the definitions of hazardous wastes in the national laws of member countries; second, the unclear definition of the term 'environmentally sound manner' in the management and disposal of e-waste; and third, the continued allowance for transboundary movement of e-waste for reuse and/or recovery through recycling. The escape clauses in the Basel Convention, which permit the transboundary movement of e-waste for recycling, have led to irresponsible exporters re-categorising all exported e-waste as meant for recycling (Lepawsky & McNabb 2010). GvtSgp #1 declared that the Basel Convention was still ineffective in addressing the present challenges, stating:

> Basel does not have enough teeth to be able to do anything. There are far too many loopholes. We know of so many cases of illegal shipments coming through Singapore, but what can we seriously do? (Interview with GvtSgp #1, Singapore,)

GvtSgp #1 highlighted a key problem with the Basel Convention – whilst in principle the Convention sets out a potent control mechanism, in practice there have been distinct shortcomings in ensuring its effective administration. There is hence a divergence in the discourse and the practice of the Basel Convention that on the one hand sets out a framework that seeks to monitor, control and regulate the global movement of e-waste and other hazardous waste, yet on the other falls

short of succeeding as a result of failures in the day-to-day application of the legislation and regulation that are set out by individual parties within their jurisdiction. In the context of this thesis, several interviewees including high-ranking government officials (GvtMys #1, #2, #4; GvtPng #1; GvtSgp #1, #2, #5), were well aware of the Basel Convention, but recognise that in practice it had been rather lacklustre regarding its efficacy. In this sense, the Basel Convention has had few impacts on the organisation of the regional e-waste recycling network in Malaysia and Singapore, save for two noticeable effects. First, the lack of stringent application of laws within national borders that are meant to fulfil a commitment to the Basel Convention has created a sense of opportunism amongst illegal traders who are aware of the lax monitoring and regulation by certain countries. Second, the Basel Convention has motivated illegal traders in e-waste to devise more ingenious methods of carrying out their trade, such as mixing e-waste components with other metals scraps to allow for shipments to be declared as 'mixed metal scraps', or to find other methods to avoid detection by authorities (IEWKul #1; IEWPng #2; IEWSgp #1, #2, #4).

### 4.3.2 National Governments and Legislation on E-Waste

The effectiveness of government institutions in regulating the transboundary flows of e-waste has been partial at best. As mentioned earlier, although Malaysia and Singapore are both signatories to the Basel Convention and have enacted legislation restricting the international trade in e-waste, there continues to exist a significant industry focussed on the illegal recycling and trade of e-waste in and between both countries, and indeed the rest of the world.

To fulfil their commitments to ratifying the Basel Convention, the governments of Malaysia and Singapore have passed laws that define and make it illegal to import and export hazardous waste (including e-waste) without prior consent from both the sending and receiving countries. In Malaysia, the competent authority handling issues related to the Basel Convention is the Department of Environment, which administers the *Environmental Quality Act 1974*, and the *Customs (Prohibition of Export) Order 2012*. In Singapore, the competent authority is the National Environment Agency, under the Ministry of the Environment and Water Resources. It administers the *Hazardous Waste (Control of Export, Import or Transit) Act* that entered into force in May 1998. These laws have however had little effect in limiting the flows of e-waste in the region and have had little impact on the structure of the regional e-waste recycling network in Malaysia and Singapore.

Indeed, while both countries have legal frameworks to address the (il)legal trade in e-waste, the impacts of the regulations have been minimal in influencing the organisation of the regional e-waste recycling network. Indeed, the ineffectiveness of government action at regulating the trade in e-waste has been critical to enabling transboundary e-waste movements in Malaysia and Singapore. GvtSgp #5 shared his views on monitoring e-waste flows in to, out of and through Singapore:

> It really is not easy at all. We have so many other concerns to address, especially the problem of domestic waste management and what we are going to do with all the waste that Singapore generates. To be frank with you, e-waste does not come up high on the agenda. In fact, there have been situations where the Customs people are not even sure who is in charge of monitoring the situation.
>
> (Interview with GvtSgp #5, Singapore)

GvtSgp #5 highlights an issue that is prevalent in many countries – the management of the trade in e-waste is not high on the agenda of governments. The situation in Singapore is not uncommon and is similarly echoed in Malaysia. GvtMys #1 described the ineffectiveness of government institutions in regulating the flow of e-waste:

> There was a case of a businessman from USA who wanted to export e-waste to Malaysia for processing. He sent us his papers, but we didn't manage to get back to him till four months later. We never heard from him again. He vanished. Later on, about a year later, we found out that he had actually succeeded in exporting the shipment to Malaysia, had paid the customs officer, and had already taken his money and run off. We were shocked. How did this happen? I also cannot tell you how.
>
> (Interview with GvtMys #1, Putrajaya)

Thus far, I have demonstrated that although international conventions and national laws exist to regulate the illegal trade in hazardous wastes – particularly e-waste – these are ineffective in stemming the continued existence and flow of e-waste across national boundaries. In this sense, they have had little impact on the patterns of trade in e-waste in the regional e-waste recycling network in Malaysia and Singapore. However, beyond being a regulator (or not) of e-waste management, governments in Malaysia and Singapore are in fact key actors in social and welfare policies, and employment and labour laws, which all have the ability of enabling *karung guni* to operate within the regional e-waste recycling network (see also Chapter 6). It is to these policies that I turn to in the next section.

### 4.3.3 Social Policies

Social policies are important in enabling *karung guni* to conduct their business of collecting, dismantling, sorting and selling e-waste components in Malaysia and Singapore. In addition to the state, there are other broader support mechanisms such as the family that are important in providing assistance to *karung guni*, for example, family networks (see section 6.3.4). In this section, I argue that the state plays an important role in bolstering the social reproduction and survival of *karung guni* through various social policies. In addition, the subsidies may be understood as *de facto* subsidies to capital, by reducing the pressures that *karung guni* place on wholesalers and recycling firms when negotiating the price for their primary processed e-waste.

The first mechanism by which the state relates to informal labour in the regional e-waste recycling network in Malaysia and Singapore is through a system of subsidised public housing to provide affordable, low-cost housing for its citizens. In Malaysia, this is carried out under the auspices of the Ministry of Housing and Local Government, through its National Housing Policy programme. In Singapore, the Housing and Development Board, a statutory board under the auspices of the Ministry of National Development, provides and manages public housing. Both Malaysian and Singaporean governments perceive public housing as a means to increase the rootedness of their citizens, while also promoting a sense of pride and ownership in the nation's economic development (Yahaya 1989; Teo & Huang 1996; Tan 2008; Teo & Lin 2011; Bakhtyar et al. 2013;). Importantly, affordable public housing has been key to *karung guni* in Singapore who utilise the home-

space both for social reproduction and as a work-space. Similarly, around 60% of *karung guni* interviewed in Malaysia live in government subsidised public housing. Both of these groups are able to continue in their trade through the positive enabling effects of affordable public housing. Moreover, both Malaysia and Singapore, although not welfare states, provide significant levels of subsidies to households for the provision and consumption of water and utilities. Above and beyond the general subsidies enjoyed by the general population, as low-income households, more than 90% of *karung guni* in Singapore, and around 85% of *karung guni* in Malaysia, enjoyed additional financial assistance from their respective governments for water and utilities bills. On a related point, the concentration of public housing in high-rise estates in Singapore also lends itself to the activities of *karung guni* by clustering a critical mass of households in a highly concentrated area for collection (see section 4.4)

The second mechanism is compulsory comprehensive savings programmes, known in Malaysia as *Kumpulan Wang Simpanan Pekerja* (Employee Pension/Provident Fund), and in Singapore as the Central Provident Fund, which serves as means of providing financial security in retirement (Sherraden et al. 1995; McKinnon 1996; McKinnon et al. 1997; Asher 1998; Vasoo & Lee 2001). A system of pensions does not exist in Malaysia and Singapore. However, these programmes are cold comfort for *karung guni* who are not required to make contributions to these funds. As self-employed individuals (who may also not accurately declare their income), *karung guni* are not obliged to make contributions to the Provident Fund, and are thus potentially losing out on the financial security that this savings programme provides. 34 out of the 46 *karung*

*guni* in Singapore involved in this study, and 29 of the 41 *karung guni* in Malaysia who were interviewed stated that they did not make regular contributions to their provident fund accounts. Hence although in principle the provident fund exists to provide citizens with financial stability in their sunset years, this option is not exercised by *karung guni*, who continue to lead precarious livelihoods in their later years (elaborated further in Section 6.3.1). The lack of participation in compulsory comprehensive savings programmes leaves many *karung guni* continuing with their e-waste collecting activities beyond the retirement age, and places considerable pressures on their social reproduction, sometimes leading to them not being able to continue as *karung guni* (KGKul #19; KGPng #18; UKGSgp #3, #6).

Informal labour in Malaysia and Singapore exists in various sectors of the economy, and has been accepted by the governments as part and parcel of the labour market. In Malaysia, the government views informal labour as an inevitable facet of the economy, as GvtMys #1 argued:

> Some of us are employed, some of us are not. If you are not employed, you still need to have food on the table right? So you find work by doing odd-jobs,… informal work. It is an accepted situation here… They don't disturb others, we will not disturb them.
>
> (Interview with GvtMys #1, Putrajaya)

GvtMys #1 also suggested that all forms of work are 'good', and that it was much better than resorting to theft or other criminal forms of financial gain. Similarly, GvtSgp #4 argued that *karung guni* in Singapore are generally tolerated:

> Not all of us can find employment in regular office jobs. Many do, others don't. So? The main point is that they do not become a social blight,… or an eyesore for our landscape. My view is… they do what they want to do,… just don't go against the law.
>
> (Interview with GvtSgp #4, Singapore)

In essence, the passive view of both the Malaysian and Singaporean governments towards informal work, and in this case, *karung guni*, has been an enabling factor to the continued existence and participation of *karung guni* in the regional e-waste recycling network.

In this section, I have argued that while in principle, the Basel Convention was established with good intentions and with a comprehensive legislative framework to regulate the international trade in hazardous waste, in practice it has been relatively ineffective in impacting the continued trade in hazardous waste, particularly the regional e-waste recycling network in Malaysia and Singapore. In addition, I have explored the important role of governments as both regulators (or not) of e-waste flows in and out of its national borders, and as key actors in social policy that has significant impacts on the ability of *karung guni* to articulate with the regional e-waste recycling network in Malaysia and Singapore. In the following section, I explore and analyse the role of territoriality in shaping the opportunities for value creation and the extraction of value by actors in the e-waste recycling networks in Malaysia and Singapore (see also Chapter 5 on the revalorisation of e-waste).

## 4.4 Territoriality/Territorial Embeddedness

The geographies of e-waste collection and management (including the geographies of e-waste recycling activities) and the spatial practices of *karung guni* in Malaysia and Singapore have significant impacts on the ability of actors to create and capture value in the e-waste recycling network by determining the access that actors have to e-waste. "Territoriality" or "geographic scope", according to Gereffi (1994, p.97; see also Gereffi & Fernandez-Stark 2011) refers to the "spatial dispersion or concentration of production and distribution networks, comprised of enterprises of different sizes and types". Underscoring the importance of geographical location to commodity chains, Talbot (2009, p.94) has argued that "[a]ll commodity chains, then, are rooted, …, in some extractive activity taking place in specific geographical locations", and that it is important to "trace the chains back to these locations and analyse their social, cultural, economic and environmental impacts". However, I take issue with Gereffi's (1994) descriptive interpretation of territoriality, and instead argue that space is co-constitutive of the development and structure of patterns of global production. I echo scholars in the global production networks tradition who have highlighted the importance of paying attention to "territorial embeddedness" – in particular with regard to regional development – underscoring the significance of *place-specific* conditions and attributes to the organisation of global production (Dicken et al. 2001; Henderson et al. 2002; Coe et al. 2004; Hess 2004). Hess (2004, p.180) argued that territorial embeddedness may be understood as the "localized manifestations of networks or the nodes in global networks… [and] global production networks are by no means deterritorialized". In response to this integral facet of production

network research, in the following section, I examine the spatial dispersion and concentration of different processes in the regional e-waste recycling network in Malaysia and Singapore, illustrating the distribution of e-waste recycling facilities in Malaysia and Singapore, and highlight the major centres of concentration of recycling activities. Importantly, I highlight how these locations influence the shape of the network. Moreover, this section explores the question of where the recycled precious metals are sent to as a means of setting out the territoriality of the regional e-waste recycling network in Malaysia and Singapore. Secondarily, I analyse the collection routines, practices of territorialisation and geographies of *karung guni* and public waste collectors in Malaysia and Singapore, and how this results in complex geometries of competition and cooperation.

The spatial concentration of collection activities in Malaysia and Singapore lie within large urban cities, most notably in the densest conurbations of the Greater Klang Valley (comprising the Federal Territory of Kuala Lumpur; the Federal Territory of Putrajaya; and the cities of Shah Alam and Petaling Jaya, Selangor), and Greater Penang (comprising Penang Island, Butterworth, Sebarang Perai and parts of Kedah state), and the island-state of Singapore, which is entirely urbanised (Samad Hadi 2009; Samad Hadi et al. 2011; Duvall 2012; Yakob et al. 2012; Abdul-Majeed & Ismail 2013). Table 4.1 illustrates the urbanisation rates, median income and population density of the Federal Territory of Kuala Lumpur, the Federal Territory of Putrajaya, the state of Selangor, the state of Penang in Malaysia; and the Republic of Singapore.

Kuala Lumpur, Putrajaya, Selangor and Penang are both the most urbanised and densest territories in Malaysia, and also the highest ranked in terms of median household income – the median household income for Malaysia is MYR 3,626 (≈USD 1,097). Higher household incomes indicate that residents in these areas have a higher disposable income to purchase electrical and electronic goods, and to replace them at a faster pace than the rest of Malaysia. Indeed, the higher disposable income, coupled with the high population density make these territories –especially the cities of Kuala Lumpur; Putrajaya; Shah Alam and Petaling Jaya in Selangor; and Georgetown in Penang – ideal places for the collection of e-waste. Moreover, the Multimedia Super Corridor, a special economic zone that includes the iconic Petronas Towers, Kuala Lumpur International Airport, Port Klang, Putrajaya and Cyberjaya, which was established with the objective of catapulting Malaysia into the information and communications technology age (in line with its Vision 2020 to be a developed nation by 2020), envisions an increase in the development and adoption of information and multimedia technology in the region (Bunnell 2002; Bunnell et al. 2002; Bunnell 2004; Lepawsky 2005a; Lepawsky 2005b; Lepawsky 2009).

In addition, Bayan Lepas in the southeast region of Penang Island, dubbed the 'Silicon Valley of the East' (Lepawsky 2005a), is home to many electronics and electrical equipment manufacturers, including AMD, Dell, Motorola, Bosch, Osram, Seagate and Agilent. From observations during fieldwork, these facilities are also known to sell their defective e-waste to *karung guni*, provided they are not patented components. Singapore, in a similar way, is an ideal location for the collection of e-waste, and may be considered to be an 'urban mine' for precious

metals and elements in waste electrical and electronic equipment (Yamasue et al. 2008; Yamasue et al. 2009). As argued in Chapter 1, Singapore is a significant consumer of electronic and electrical equipment, and is a key manufacturer of advanced electronic and electrical products in Southeast Asia (Hobday 1994; Wong 1995; Wong 1997; Brown 1998; Perry & Hui 1998).

**Table 4.1: Urbanisation Rates, Population Density and Median Income in Selected Regions in Malaysia, and Singapore**

| Territory/Indicator | | Urbanisation Rate (%) | Population Density (per square km) | Median Monthly Household Income |
|---|---|---|---|---|
| **MALAYSIA** | Federal Territory of Kuala Lumpur | 100 | 6,891 | MYR 5,847 (≈USD 1,770) |
| | Federal Territory of Putrajaya | 100 | 1,478 | MYR 6,486 (≈USD 1,966) |
| | State of Penang | 90.8 | 1,490 | MYR 4,039 (≈USD 1,222) |
| | State of Selangor | 91.4 | 674 | MYR 5,353 (≈USD 1,620) |
| **SINGAPORE** | Republic of Singapore | 100 | 7,422 | SGD 7,570 (≈USD 5,963) |

Adapted from Department of Statistics, Malaysia (2011); Department of Statistics, Malaysia (2013a); Department of Statistics, Malaysia (2013b); Department of Statistics, Singapore (2013a); Department of Statistics, Singapore (2013b).

In terms of disassembly and sorting, *karung guni* in Singapore, who often carry out the disassembly and sorting of e-waste in their homes, live in a generally homogenous distribution across the island. Given the small geographical area of Singapore, it is understandable that distance is not a great consideration for *karung guni* to transport e-waste after they have collected it from households and small businesses. In the Klang Valley, of the 20 *karung guni* interviewed in Kuala Lumpur, six live in Shah Alam, the capital of Selangor; eight live in Petaling Jaya, the city which is adjacent to Kuala Lumpur, and six live within Kuala Lumpur. None

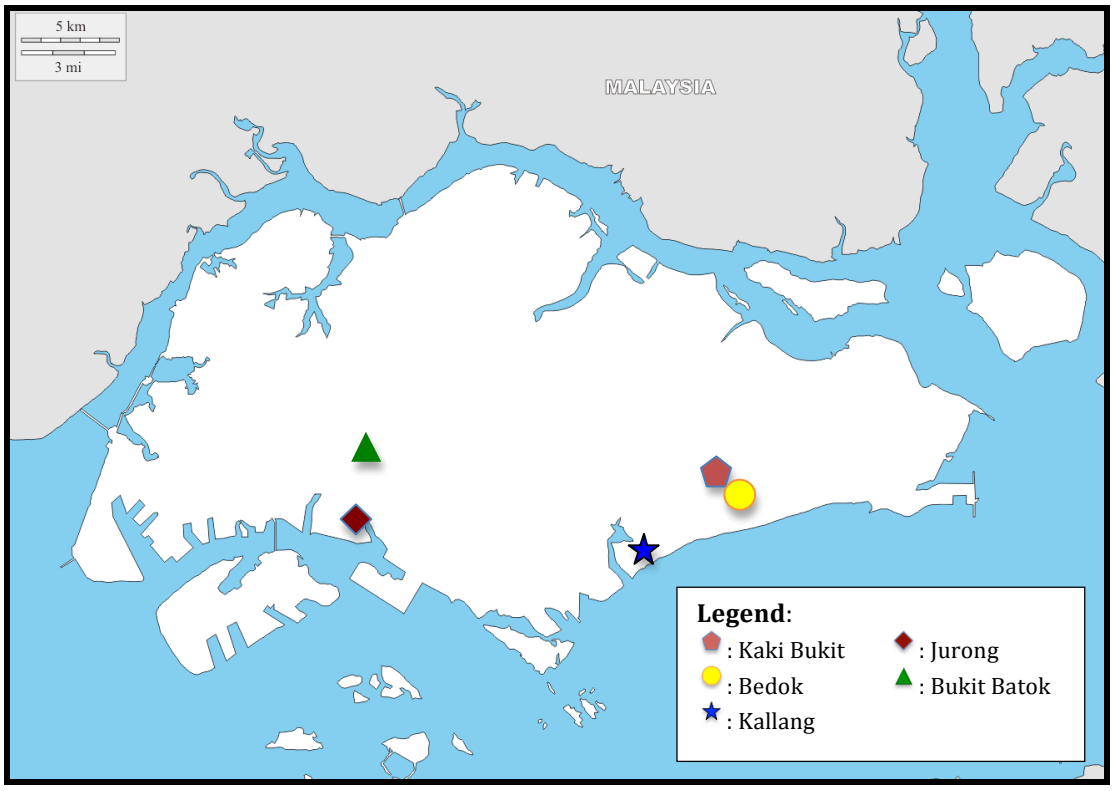
of them live in Putrajaya, as Putrajaya is a relatively new city, and is the administrative capital of the country, with little social life after working hours. Moreover, Putrajaya has few subsidised housing options, and even then, they are usually flats rather than landed properties, which are too expensive for *karung guni* in Kuala Lumpur to afford.

Of the 21 *karung guni* in Penang, 13 live on the main peninsular, in the Sebarang Perai area, and the remaining eight live in different parts of Penang Island. The residence of these *karung guni* in Penang holds significance for the geography of their activities, as *karung guni* on the main peninsular primarily collected e-waste from factories in the Perai industrial estates, while the *karung guni* resident on Penang Island collected primarily from the factories located at Bayan Lepas. In essence though, the work of disassembling, dismantling and sorting e-waste is always done within the homes of *karung guni*, regardless of it being a flat, or a landed property. In this sense, the processes are carried out within residential areas rather than industrial areas – an indication of the blurring of distinctions between home-spaces and work-spaces (see Chapter 6).

E-waste wholesale activities tend to cluster together, both in Malaysia and Singapore. The distribution of e-waste recycling activities in Singapore are shown in Figure 4.5. For example, all eleven e-waste wholesalers in Singapore that were interviewed are located in flatted factories and industrial parks, which are used to house light industries, and are found around the fringes of suburban satellite towns. These include Kaki Bukit, Kallang and Bedok in the eastern region of the island, and Jurong and Bukit Batok in the western region of Singapore. In each of

these light industrial estates, it is common to find an average of two to five e-waste wholesalers. In Malaysia, while there are many e-waste wholesalers located throughout the country, I found a concentration of them both in Kuala Lumpur and Penang. In Kuala Lumpur, I found two areas where they were concentrated – one in Brickfields, and the other in Kepong. These each had between ten to fifteen e-waste wholesalers in the immediate area. In Penang, three clusters of e-waste wholesalers were found, with an average of fifteen to twenty e-waste wholesalers in one area – one in Butterworth, one in Perai, and one in Bayan Lepas.

**Figure 4.5: Map of Singapore, Indicating Distribution of E-Waste Recycling Activities**




Adapted from: D-maps Free Maps (www.d-maps.com)

Partial and full e-waste recycling firms in Singapore and Malaysia were clustered in the same areas as the manufacturing facilities for electrical and electronic

products. In Singapore, the firms were clustered in the Benoi and Tuas areas, towards the western region of the island, near to the Jurong port area. In Penang, nine of the eleven e-waste recycling firms interviewed were found in Perai, on the main peninsular, with the other two in Bayan Lepas. In the Klang Valley, only two of the nine e-waste recycling firms interviewed were in Kuala Lumpur (Kepong), while the remaining seven were located in Shah Alam, Selangor.

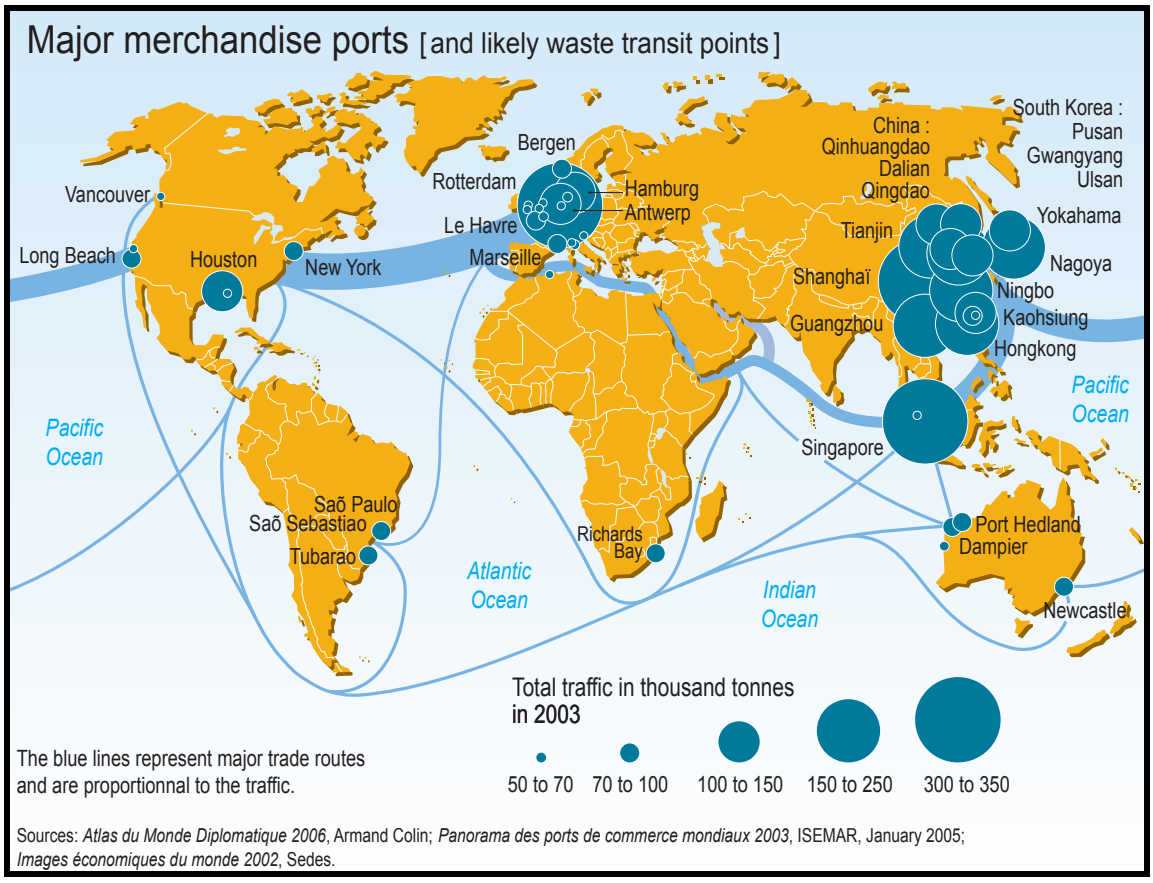
### 4.4.1 International Transport Links and Territoriality

As argued in Chapter 1, Malaysia and Singapore are key importers and exporters of e-waste (at various stages of processing). In this sense, the proximity of the e-waste recycling facilities to port facilities is vital to the global trade in e-waste. Importantly, the recycled precious metals are meant not only for manufacturing inputs in Malaysia and Singapore, but are often exported as well. Transport connectivity thus plays a crucial role in the spatial configuration of the regional e-waste recycling network. Malaysia and Singapore, whose ports are major transhipment hubs in international maritime trade, are key points for the import of e-waste from overseas and also for the export of e-waste and recycled metals to other countries as well (Fischer 2009; Kalra 2004; Lundgren 2012; Kojima 2005).

The ports of Tanjung Pelapas and Pasir Gudang in Johor, Malaysia, to the south of the Malay Peninsular, are key points for the export of recycled metals for manufacturing in China, Taiwan, and Thailand (FRERKul #1, #3; PRERKul #2, FRERPng #3). On the western side of the Malay Peninsular, Port Klang (an economic free zone), near to Kuala Lumpur and Shah Alam, and the Port of Penang

both serve as exit points for recycled metals to India and Bangladesh (FRERPng #1, #2, #5; FRERKul #2). Similarly, the ports of Pasir Panjang and Jurong, Singapore, exports recycled metals to Thailand, Taiwan, China, South Korea, and India (FRERSgp #1, #2, #4, #5, #8).

**Figure 4.6: Major Merchandise Ports**




Source: UNEP (2006)

Figure 4.6, from the UNEP, illustrates the major ports in the world, and indicates that these ports are likely points for the trafficking of waste – including e-waste – with Malaysia and Singapore being marked as significant waste transit points. In addition, between Singapore and Malaysia, there is an extensive rail network that links Singapore to the major cities of Kuala Lumpur and Penang in Malaysia, and

Bangkok and Chiang Mai in Thailand. The Johor-Singapore Causeway and the Malaysia-Singapore Second Link are bridges that cross the Johor Straits and link Singapore to the main peninsular of Malaysia. Four out of the six partial e-waste recycling firms in Kuala Lumpur/Selangor interviewed stated that they regularly exported partially processed e-waste to Singapore via trucks across the Causeway when they were unable to sell their e-waste to full-recovery e-waste recycling firms in Selangor or Penang. Moreover, the extensive road network also acts as a conduit for the transportation of recycled metals from Malaysia to Thailand, across the border in the north of Malaysia (FRERPng #1, #3; FRERKul #1).

### 4.4.2 The Spatial Practices of Public Waste Collectors and *Karung Guni*

In the above section, I have discussed the territoriality of the regional e-waste recycling network in Malaysia and Singapore. Importantly, I have highlighted the prominence of Kuala Lumpur and the Greater Klang Valley, and Penang in Malaysia, and Singapore (the three main sites of fieldwork) in the production and management of e-waste in the Malaysia-Singapore region. In the following, I discuss the territorial embeddedness of *karung guni* in Malaysia and Singapore, and highlight the geographies of their collection activities.

In Malaysia, municipal solid waste disposal contractors who have won a tender from the local municipal council to collect waste from households and transport it to landfills. The regulation of these services is under the purview of the state government and also of the federal Department of Environment. However, e-waste collection and recycling are not part of the duties of the disposal contractors.

In Singapore, four public waste collectors (PWCs) currently operate as sub-contractors of municipal solid waste and recycling collection and are under the purview of the National Environment Agency, a statutory board operating under the auspices of the Ministry of National Development. Since 2001, these sub-contractors have had to put in place infrastructure to support the mandatory National Recycling Programme (NRP) that stipulates the minimum facilities and collection frequency required to secure contracts in any of the nine residential districts in Singapore (NEA 2013). These PWCs thus operate within the specific residential districts for which they have won the tender, and provide recycling bins in each of these regions. The products that they recycle are limited to glass and plastic containers and bottles, newspapers and other paper products, and aluminium and tin cans. As seen in Figure 4.7, collection is carried out only once a week. These bins serve as the collection point for about five blocks of public housing apartments, and are often overflowing, suggesting that public waste collectors in Singapore are ineffective and inefficient in their management of recyclable waste.

Similar to the situation in Malaysia, PWCs are not obligated to provide collection and disposal services for e-waste. The lack of collection services by PWCs for e-waste has resulted in a dilemma for town councils that provide waste collection and removal services for residents in their districts. In public housing estates in Singapore, bulky waste and e-waste from households can be collected by employees of the town council, as mentioned above by PHResSgp #1, and whilst this service is provided by the town council to residents, it is often the practice of

residents to give a small monetary token to the workers for their efforts (i.e. residents 'pay' for the service vis-à-vis selling e-waste to *karung guni* where residents receive money). Nevertheless, the service provided by the town council does not address the existing issue of how the town council disposes of the bulky items or e-waste. TCWCSgp #1 suggests:

> We will see if it (the bulky item or e-waste) still can be used. If it is still working, we keep it for ourselves. If it is spoilt, we will sell it to *karung guni*, or if we don't want it, we will sell it to *karung guni*. In the worst case scenario, we will break the furniture into smaller parts, and then mix it with the household waste for the garbage truck to collect. The electronic products like televisions and fridges we always sell to *karung guni* if we don't want it.
>
> (Interview with TCWCSgp #1, Singapore)

**Figure 4.7: Recycling Bin in Singapore Public Housing Estate**


(Author's Photograph)

Indeed, town council waste collectors sell e-waste that they cannot reuse themselves to *karung guni* because they would otherwise have no means of disposal (other than sending it for incineration) which then removes the potential income they may receive from selling the unwanted e-waste to *karung guni*. In this regard, *karung guni* provide services both directly to households, and also to the town councils, and address a gap in disposal management by the town councils.

Unlike PWCs who operate within specific regions and only collect the recycled waste on one day of the week, *karung guni* are geographically footloose, and operate across Singapore. This situation is similar in Malaysia, where *karung guni* operate around different housing estates, and *karung guni* in Kuala Lumpur often travel out to Shah Alam and Petaling Jaya, whilst those on Penang Island also make trips out to Bukit Mertajam and Butterworth on the main peninsular (KGKul #3, #11, #17; KGPng #5, #20). *Karung guni* in Singapore often get the attention of their potential customers by using a bicycle horn to alert residents to their presence in the area and shouting out the common stock phrase: "*Karung guni! Siu po cua, lay lio, sah kor, tiang see kee!*" ("*Karung guni*! Collecting newspapers, radio, old clothes, TVs!"). Similarly, in Malaysia, *karung guni* draw the attention of householders and small businesses by tooting their horns. In terms of territory, *karung guni* in Malaysia and Singapore tend to have a fixed geographical area where they operate, and in so doing have established relationships with some of the households and small and medium businesses that they serve. In Singapore, *karung guni* generally do not operate within the central business district, because of previous arrests by police for public nuisance. Yet, this has not stopped some

*karung guni* from making collection rounds in the CBD. GvtSgp #3 argued that these arrests are justified, as it projects an 'undesirable' image to international businesses that are located in the central business district:

> The CBD is for business, for commerce. Every year we have a number of *karung guni* who get fined for being a public nuisance in the CBD. *Karung guni* cannot just go around making noise anywhere they want. They also drive at slow speeds, so traffic flow slows down. Its just a nuisance, and an eyesore in the city.
>
> (Interview with GvtSgp #3, Singapore)

Even so, the previous arrests by police have not prevented some *karung guni* in Singapore from going on collection rounds to small businesses in the central business district who have made prior arrangements for their collection services. In these instances, *karung guni* go there without tooting their horn or announcing their presence, but go directly to the office of the small business concerned and perform a removal service for them. This more discreet way of collection enables *karung guni* to collect e-waste from the central business district, while avoiding unwelcome attention from law enforcement agencies. In addition, modern skyscrapers and office buildings in the CBD in Singapore are now air-conditioned, thus proving to be a barrier to *karung guni*'s advertising of their presence in the area, with one *karung guni* calling it "a waste of time to go to the CBD" (UKGSgp #25, also LKGSgp #1, #4, #5; UKGSgp #3, #7, #11, #32).

42 out of 46 *karung guni* in Singapore tend to operate in specific housing estates where they have built up relationships with the residents. These relationships of familiarity between residents and *karung guni* result in instances where, although

there may be more than fifteen *karung guni* doing collection rounds in a given residential estate, residents will hold on to their e-waste until their favoured *karung guni* comes on collection rounds. UKGSgp #32 said:

> I started as a *karung guni* in this place, that is almost twenty years ago now. Many of the residents know me, and will specially wait for me to arrive on my rounds instead of selling their goods to other *karung guni*. When you have built a rapport with the residents, you know that they will support you in any way possible. I have been given even drinks sometimes by some of them. We are friends.
>
> (Interview with UKGSgp #32, Singapore)

In Singapore, there are some norms that govern the *karung guni* trade. These are not written down but are commonly understood as the accepted rules of the trade. These norms ensure that *karung guni* reduce their conflicts over claims to an area with one another, and also increase the likelihood of being able to eke out a living by having a fair chance at collecting e-waste. These norms that loosely govern the interactions amongst *karung guni* may be interpreted as a means of ensuring the survival through 'equal opportunity' at accessing waste, in particular e-waste. I first noticed these rules during my fieldwork when I accompanied *karung guni* on their collection rounds. My observations were further validated by *karung guni* in Singapore when asked if they had any rules and regulations governing their trade. According to interviews with all 46 *karung guni* in Singapore, these norms exist mainly to protect and bolster against the negative impacts of their already unpredictable income levels. Foremost among them is the understanding that if one *karung guni* is already present and doing a collection round in the residential estate, no other *karung guni* can start his round until the former has finished.

Second, they do not rummage through rubbish bins for recyclable waste, since this has resulted in some cases of violent conflicts with town council waste collectors, and municipal solid waste collectors (Lee 2001; Nadarajan 2004; Khoo 2008). Third, they do not undercut each other in their dealings with e-waste wholesalers. Usually information about prices paid by e-waste wholesalers is exchanged during informal breaks at coffee-shops, and when they encounter each other while making their collection rounds (LKGSgp #1, #3, #5; UKGSgp #2, #12, #14, #17, #23, #31, #33, #40). UKGSgp #13 argued:

> … if you see another *karung guni* there already, you wait. Going there is not a proper thing to do. He came first, he has first pick. The same applies for when I am in an area, I would not want another *karung guni* to come along and compete with me for business. We usually only stay in one estate for about an hour or so, and it's easy for another *karung guni* to take over after that. Sometimes if I go to an area and I see someone there already, I will ask him how long more he will take, then come back later on when he has gone. There is always more than enough to collect.
>
> (Interview with UKGSgp #13, Singapore)

In Malaysia, the only norm that I observed amongst *karung guni* was that they generally would not go into an area when another *karung guni* was already there, and would instead find another estate to collect e-waste from. Yet, this did not stop some *karung guni* from following closely behind another, and would sometimes be collecting on streets that ran parallel to each other. Social interaction amongst *karung guni* was common, but appeared to rarely focus on issues pertaining to business practices or the prices of e-waste (KGKul #14, #17; KGPng 7, #19).

There is a keen sense of competition between municipal waste collectors and *karung guni* with regard to the collection of recyclable goods, especially glass, plastic containers, bottles and newspapers, but as mentioned earlier, PWCs do not collect e-waste and are thus not in competition directly with *karung guni* for this. However, the employees of town councils who collect bulky items and e-waste from households are in competition with *karung guni* for e-waste and use their 'official' status to stake their claim. TCWCSgp #2 argues:

> We serve the residents here without fail. Our day off is Sunday. So this area is rightfully mine to collect whatever I want. I am employed by town council to do this. *Karung guni* come here and cause all the trouble, making so much noise. If they [*karung guni*] want to compete with me, then they lose because I am very good at collecting… But I still sell to *karung guni* what I don't want. If I don't sell to them, who can I sell to? At least if I sell to *karung guni* I can get some money also
>
> (Interview with TCWCSgp #2, Singapore)

In spite of the obvious disdain TCWCSgp #2 has towards *karung guni*, he recognises that he is reliant on *karung guni* to purchase e-waste that he sees little use for or value in, and the money gained through this transaction is an important supplement to his income.

Competition between *karung guni* and voluntary organisations also exists, in particular in the collection of e-waste. Voluntary organisations that collect e-waste from households do not buy e-waste but rather rely on the goodwill of households in giving it away for free (James 2000; James 2001). The voluntary organisations collect e-waste with the objective of dismantling and then sorting the components

to sell on to e-waste wholesalers, much in the same way as *karung guni*, with fundraising as their main motivation. *Karung guni* see this as a direct challenge to their livelihoods, as UKGSgp #15 declared:

> These voluntary organisations come and collect from the households. They don't follow the same rules like we do. Even when I am around, they also want to collect at the same time. If this keeps on going on, I might need to be asking for assistance and welfare from them!
>
> (Interview with UKGSgp #15, Singapore)

Whilst in terms of geographic scope, *karung guni* are relatively footloose, they tend to face competition and have found cooperation between themselves as a mechanism for survival. The territorial practices of *karung guni* in the manipulation of spatio-temporal dynamics have distinct impacts on their ability to create value through the amounts of e-waste they are able to collect. By being able to collect more e-waste to disassemble and sort, they are also better able to negotiate prices with the e-waste wholesalers and commercial e-waste processing firms, and thus increase their value capture (see Chapter 5 for further elaboration). In this sense, *karung guni*'s access to e-waste is critical to their opportunities for value creation, enhancement and capture. This significantly impacts the social reproduction capabilities of *karung guni*.

In this section, I have examined the territoriality of the regional e-waste recycling network in Malaysia and Singapore, and also explored the territorial practices of *karung guni* in Malaysia and Singapore. It is important to note the concentration of *karung guni* within highly urbanised areas, while paying attention to the

concentration of e-waste wholesalers and e-waste recycling firms in specific regions of the cities under investigation. I argued that the high levels of urbanisation have been crucial to the potential for *karung guni* to collect e-waste, and that the home-space is important to them for dismantling and sorting activities. I contend that international trading connections are pivotal to the continued existence of the regional e-waste recycling network in Malaysia and Singapore as this supplements the volumes of e-waste available for processing. Lastly, I argued that *karung guni* engage in spatial practices of competition and cooperation to increase their value creation, enhancement and capture potentials through their continued access to a reliable supply of e-waste.

## 4.5 Conclusion

This chapter has set the context in which the e-waste trade in Malaysia and Singapore operates, and have argued that processes occuring both at global and regional scales have significant impacts on the configuration of the regional e-waste recycling network. I first identified and unpacked the input-output structure – actors and linkages – connecting the key actors in the e-waste recycling networks in Malaysia and Singapore. In so doing, I argued that through an interrogation of the input-output structure, the processes of value (re)creation in e-waste are illuminated. Second, I examined the chain governance of the network and argued that chain governance sheds light on the control and coordination of the chain by original brand manufacturers. Moreover, an understanding of chain governance is crucial to analysing the value creation, enhancement and capture potential of the

actors in the network. Third, I found that the international and national scale institutions regulating the international movement of e-waste while existing in principle, have had the reverse effect of creating opportunities for the practice of regional e-waste recycling. Furthermore, I argued that the state must not be conceptualised only as a regulator of e-waste trade, but also as an enabler of the continued existence of *karung guni* through its regulation (or not) of the informal economy, and the social policies it enacts. Fourth, I examined and analysed the role of territoriality in influencing the opportunities for *karung guni* in value creation and value capture. Claims to territory are significant to *karung guni* as this determines the amount of e-waste that they are able to collect. The analysis in this chapter provides the context towards understanding the arguments made in Chapters 5 and 6. The focus of Chapter 5 is the conceptualisation of waste as embodying value, and analyses the strategies deployed by actors in the regional e-waste recycling network in Malaysia and Singapore to increase their value creation, enhancement and capture opportunities. Chapter 6 focuses on the significance of informal labour – particularly *karung guni* – in the regional e-waste recycling network in Malaysia and Singapore. Conceptualising *karung guni* through the lens of petty commodity production, Chapter 6 interrogates their articulations with the regional e-waste recycling network.

# Chapter 5

## Value Wasted / Valued Waste

## – Dynamics and Strategies of Accumulation

## 5.0 Introduction

Distinguishing between what is 'waste' and of value is a highly contingent process that is structured by spatial and temporal factors, and influenced by norms, existing technology, and the present needs of individuals and of industry (Lepawsky & Billah 2011; Lepawsky & Mather 2011; de Oliveira et al. 2012; Moore 2012;). In this sense, what is perceived as waste now, and in a certain geographical location, may be seen as a resource in another place, and/or at another time. Commodities that are categorised as waste are arguably the product of contingent and temporary factors, such as profitability, product obsolescence, increasing patterns of consumerism and present levels of technology. This chapter begins with the objective of contributing to the literature that informs theorisations of commodities beyond the point of consumption, thus enriching GVC and GPN debates by looking at the materiality of waste and relationships among actors beyond the theoretical emphases on production – distribution – consumption (see recent discussions of this in Gregson et al. 2010; Lepawsky & Mather 2011; Brooks 2013; Crang et al. 2013; Herod et al. 2014). To this end, this chapter contributes to the literature in three ways: (1) I argue that waste embodies value in spite of being discarded by the initial consumer and is the central argument of this chapter. In this sense, 'waste' is not the end point of material, but can be reinserted into the production process through recycling and reuse; (2) through an appreciation of the value in waste, I highlight the potential and possibilities for subsequent value (re)creation, enhancement and capture in 'waste' production networks; and (3)

through this process whereby the 'waste' of one production network becomes the 'raw material' for another, I highlight the interconnectedness of production networks, and underscore the potentially continuous processes and connections through which commodities may be reintroduced into new rounds of production – distribution – consumption. This chapter seeks to address questions related to what happens to commodities after consumption by expanding the frontiers of production networks research that see consumption as the end point of a network (Dicken et al. 2001; Coe et al. 2004). Indeed, the economic life of a commodity does not end just because it is discarded, but often it continues to live on, in particular through practices of recycling and reuse.

In this chapter, I examine the apparently oppositional relationship between waste (specifically e-waste) and value as elucidated through an analysis of the regional e-waste recycling network in Malaysia and Singapore. I argue that materials often fall into the category of 'waste' when they are no longer of use to the original owners. This is the precursor to opportunities for recycling, reuse and re-insertion into production, though there are of course situations where 'waste' marks the end-of-life for materials when they end up being incinerated or in landfills. However, to shift from being 'waste' to being perceived as a 'resource' or 'raw material', discarded commodities need to be recognised as embodying value by an economic actor. I argue that *karung guni* are pivotal to this process of valuing and valuation because the regional e-waste recycling network in Malaysia and Singapore relies on the initial process of validation of value embodied in e-waste by *karung guni* through their collection of e-waste from households and small businesses. In this chapter, I employ price as a surrogate for value, as this is the

most effective way through which an understanding of the processes of value creation (through the labour process) and capture may be identified in this production network.[5]

As 'waste', commodities are sold on to *karung guni*. This serves as the starting point for a series of processes that allow for the discarded and seemingly useless commodities to be broken down and subsequently reused or recycled – a process that may be conceived as their re-birth as a commodity. These previously unwanted commodities and materials are given a new lease of life, and are once again articulated in networks of production – distribution – consumption. Recognising surplus value to be the product of social relations of production, with the *labour process* being at the core of the creation of value, this chapter interrogates the activities and practices that enable the revalorisation of 'waste', and unpacks the strategies employed by wholesalers and recycling firms to expand their influence on the network, particularly in terms of increasing their ability to create, enhance and capture value in the network. In this sense, I take up the call of other scholars who have also argued for a more nuanced understanding of the role of labour in structuring global production networks (Smith et al. 2002; Selwyn 2007; Barrientos et al. 2011; Rainnie et al. 2011; Taylor et al. 2013; Herod et al. 2014). Taken together, this chapter seeks to illuminate the relative ability of actors to leverage their position in the network to increase their value creating and

[5] In spite of my deployment of price as a surrogate for value in this chapter, I recognize that there are limitations to this equivalence. Several debates surround the "transformation problem" in Marxist political economy (Seton 1957; Samuelson 1971; Baumol 1974; Lipietz 1982; Wolff 1982; Fine 1983; Duménil 1984; Fine et al. 2004). Nonetheless, for the purpose of my analysis, price acts as a sufficient proxy to illuminate the relationships and exchanges that exist in the regional e-waste recycling network in Malaysia and Singapore.

capturing capabilities. This chapter looks not at the movement *per se* of the commodity in question (i.e. the movement of e-waste across space), but rather seeks to understand the social relations engendered in its production network through the movement of value(s) that is/are embodied in the commodity (Smith et al. 2002; Herod et al. 2014).

The discussion in this chapter proceeds as follows. In section 5.1, I discuss the relationships and transactions that are illustrated in the e-waste circuit of capital. I argue that the e-waste circuit of capital (Figure 5.1) sheds light on the significance of the labour process to value creation, enhancement and capture. The rest of this chapter draws from this analysis of the e-waste circuit of capital and examines the dynamics within the regional e-waste recycling network in Malaysia and Singapore, in particular the strategies and tactics that are used by e-waste recycling firms and e-waste wholesalers to increase their ability to create, enhance and capture value. In section 5.2 I discuss the processes that enable e-waste to be valued and valuable once again, and argue that waste embodies latent use value. Notably, this section emphasises the integral role of *karung guni* to this process of valuation. In section 5.3, I analyse the functions of the informal sector in the regional e-waste recycling network in Malaysia and Singapore. I place emphasis on the constitutive and significant role of *karung guni* and informal e-waste wholesalers to the processes and potential for value (re)creation, enhancement and capture for both firm and non-firm actors in this production network through their activities of (1) collecting, (2) disassembling, dismantling and sorting, and (3) wholesale of e-waste. In section 5.4, the agency of actors in the network is analysed by first looking at their ability to negotiate the terrain of transactions that are

structured through non-contractual arrangements, and the consequent reliance on social relations of mutual confidence to mitigate the uncertainty that these non-contractual transactions entail. I argue that economic actors in the regional e-waste recycling network in Malaysia and Singapore, in particular *karung guni*, engage in social relations of mutual confidence to overcome challenges in the e-waste trade and increase their value creation, enhancement and capture potentials.

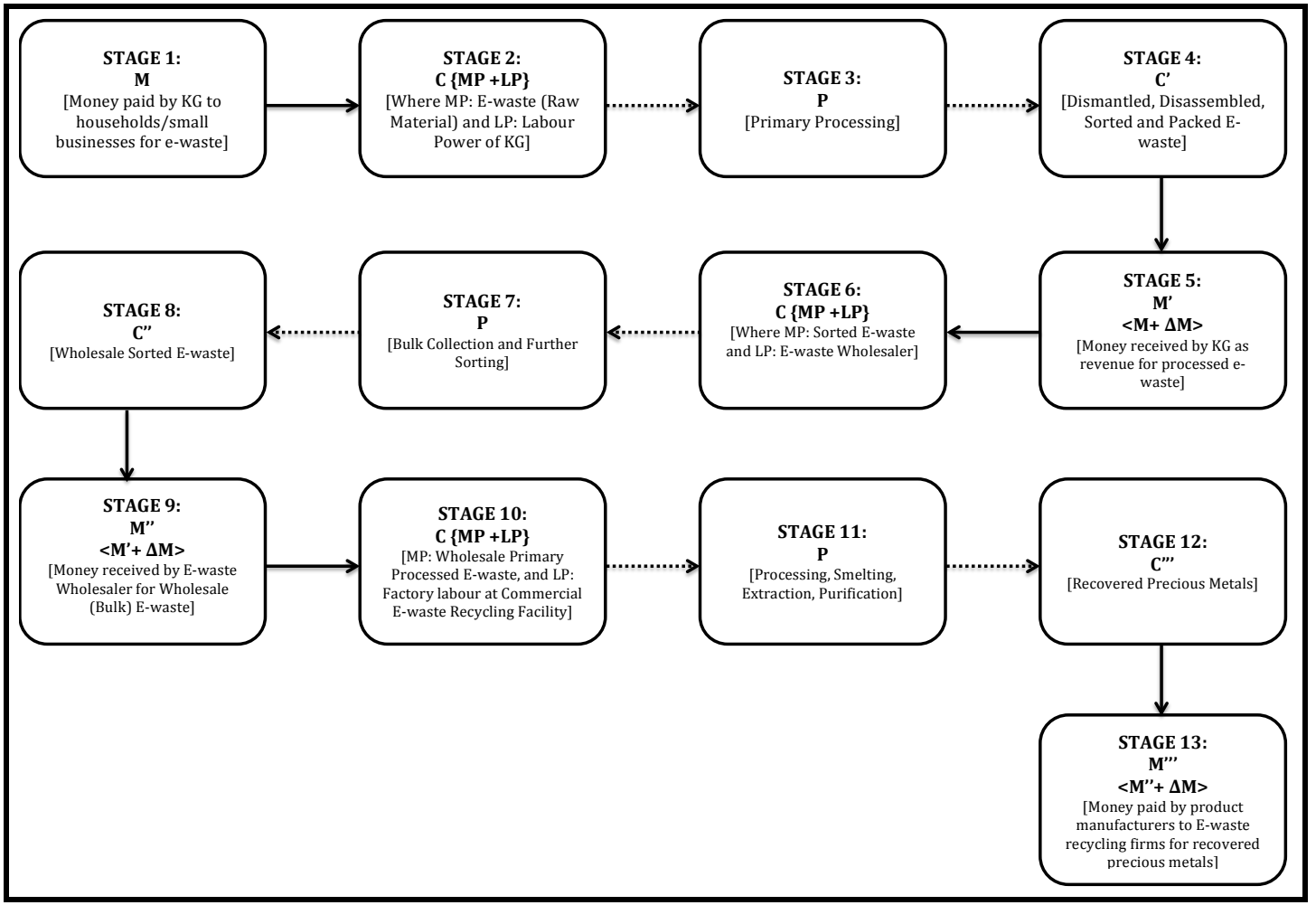
Following this thread of analysis, section 5.5 examines the strategies of accumulation that wholesalers and recycling firms in the regional e-waste recycling network in Malaysia and Singapore employ to increase their value creation, enhancement and capture potential. In the course of fieldwork, these four strategies emerged as the most significant (both empirically and theoretically) methods employed by firms to increase their potential to create, enhance and capture value. In section 5.5.1, I examine how firms have turned to improvements in technology as a means of increasing their creation and capture of value in the chain, and in section 5.5.2, I examine the utilization of international certification and other forms of third party certification by e-waste recycling firms as means to increase their opportunities and potential for value creation and value capture. Section 5.5.3 scrutinises the practices of hoarding of materials and the creation of situations of reduced supply by e-waste wholesalers in this segment of the e-waste circuit as a key strategy to affect the price of e-waste. In section 5.5.4, I analyse the strategy of externalising risk as employed by wholesalers and recycling firms. By externalising risks related to collecting e-waste to *karung guni*, wholesalers and recycling firms are distanced from the uncertainties associated with fluctuations in

supply of e-waste. Through an examination of this strategy, the centrality of *karung guni* to the value (re)creation and capture potential for the rest of this segment of the production network is emphasised. I conclude by reiterating the latent use value that is embodied in e-waste, the potential exchange value that is inherent within e-waste, and the crucial role of labour in the creation of surplus value in the e-waste circuit of capital.

## 5.1 The E-Waste Circuit of Capital

This chapter is informed by Marx's circuit of capital (Marx 1956). I have sought to adapt this approach to understand the flows of capital within this segment of the e-waste recycling network in Malaysia and Singapore, with the explicit aim of highlighting the integral role of labour and the labour process in the creation and capture of value (see also Smith et al. 2002; Herod et al. 2013; Herod et al. 2014). I argue that labour, and in particular informal labour (see Chapter 6), is integral to the processes of value creation, especially with regard to the initial collection of e-waste from households and small businesses. The e-waste circuit of capital (Figure 5.1) represents the flows of capital that exist in this segment of the e-waste recycling network, and highlights the relationships between various actors, while also stressing the functions carried out by each group of actors in facilitating the creation of value.

**Figure 5.1: E-Waste Circuit of Capital**



To situate the concrete value relations investigated in this thesis in a wider theoretical context, Figure 5.1 illustrates the circuit of capital as observed in the regional e-waste recycling network in Malaysia and Singapore. In Stage 1: (M), money is paid by *karung guni* to households and small and medium firms for their e-waste. In this way, capital moves from the money form into the commodity form as purchased e-waste. This transaction between *karung guni* and households and small businesses is akin to the purchase of means of production (raw materials) by capitalists in the market. In Stage2: (C{MP+LP}), capital in the commodity form as e-waste (means of production), is combined with the *karung guni*'s own labour power – which s/he does not purchase, since s/he owns his/her own labour power – and enters into the production process.

In Stage 3: (P), primary processing takes place and capital moves into the production form. In this instance, *karung guni* use their own labour to dismantle and disassemble e-waste, and subsequently sort it, before packaging it together. In Stage 4: (C'), capital once again moves into the commodity form as primary processed e-waste that is available to be sold to e-waste wholesalers. In Stage 5: (M' <M+ΔM>), capital in the money form is paid to *karung guni* who sell their primary processed e-waste to wholesalers. At this stage, ΔM indicates the surplus value that *karung guni* have produced and, in part, captured. In Stage 6: (C{MP+LP}), capital moves into the commodity form embodied in the primary processed e-waste, and is combined with the labour power of the e-waste wholesaler (and possibly his employees if any). In Stage 7: (P), capital moves into the production form, whereby bulk collection and further sorting of the primary processed e-waste takes place. In Stage 8, capital moves into commodity form (C'')

as wholesale sorted e-waste that is ready to be sold on the market. In Stage 9: (M'' <M'+ΔM>), money is paid to e-waste wholesalers by e-waste recycling firms. Once again, ΔM represents the surplus value that e- waste wholesalers and others have produced through the labour process. In Stage 10, e-waste recycling firms combine the wholesale primary processed e-waste (means of production) with labour power and put that to the production process, as represented by Stage 11 which includes the processes of smelting, extraction and purification of the recovered precious metals. In Stage 12, capital in the commodity form (C''') as recovered precious metals is sold on the market to contract product manufacturers. In Stage 13, capital in the money form (M''' <M''+ΔM>), is paid by contract product manufacturers to e-waste recycling firms for the recovered precious metals. Following Stage 13, the recovered precious metals from e-waste re-enters a commodity circuit as a consumer product (raw material) and becomes processed subsequently into new electronic and electrical goods. This is where the segment of the production network studied in this thesis ends.

Figures 4.1 and 4.2 that present the input-output structure of the regional e-waste recycling network in Malaysia and Singapore inform this account of the e-waste circuit of capital by identifying the actors and relationships in the process of value (re)creation, enhancement and capture in this production network. Figure 5.1 illustrates the flows and transformations of capital from the money form, into the commodity form, and the production form, to be returned to commodity form and money form. This cycle is repeated through the e-waste circuit of capital as shown. The importance of the labour process in the creation of value is seen in the movement of M…M', and subsequently from M'…M'' and M''…M'''. The surplus

value – which is the difference between M…M'; M'…M''; and M''…M''' (i.e. ΔM) – is the product of the combination of abstract labour (i.e. *social necessary labour time*) with the means of production (Marx 1956; Elson 1979). In this sense, labour power is a necessary, but not sufficient factor that needs to be combined with means of production to create surplus value. Without this combination, no surplus value can be created. The exchanges that occur at M-C and C-M are pivotal junctures that present actors with the opportunity to extract more value from the network, through strategies that are discussed in the following sections of this chapter (e.g. certification, and hoarding). C{MP+LP} are points where labour power is combined with the means of production to allow for the subsequent processes of production to take place. P indicates the production process whereby labour is combined with the means of production (e-waste at various stages of disassembly). Through the labour process surplus value is created and is embodied by the commodities that are subsequently traded. Importantly, the e-waste circuit of capital shows the flows of capital through its different forms, and exposes the relationships between various actors in the circuit. These relationships are important as they are marked by an asymmetrical distribution of power, which has the effect of affecting the value creation, enhancement and capture possibilities for the different actors in this production network. In the case of *karung guni*, the potential to create, enhance and capture value in the network has profound impacts on their social reproduction and survival potential (see Chapter 6).

In this section, I have adapted Marx's circuit of capital to understand the processes of value creation in the regional e-waste recycling network in Malaysia and

Singapore, and argue that the labour process is central to this. In addition, I have argued that informal labour – in particular *karung guni* – are central to the creation of value in this network. In the next section, I analyse the nexus of waste and value, and argue that waste – instead of being devoid of value – embodies latent use value that forms the basis for subsequent rounds of production.

## 5.2 'Waste' and Value

E-waste, when discarded by owners and recycled by others – regardless of whether through municipal garbage collection, collection by *karung guni*, or other means – embodies value, and should not be regarded as detritus and devoid of any value(s). In this regard, e-waste is not the opposite of value, but rather, 'waste' still embodies value – value that may not be perceived by the original owners who have discarded the 'waste' (Figure 5.1, Stage 1). Reiterating Marx's (1990) conception of value, commodities possess use value, exchange value and importantly, surplus value. In this e-waste circuit of capital, surplus value is created through the labour process from the activities of concrete labour.

In this section, I argue that waste is not without value. Value is inherent in waste, and a commodity is discarded only because it is seen to be of minimal or no value to the original owner. I demonstrate that the creation of surplus value relies on the *labour process* to transform what is presently 'waste' to that which is of value once again. In so doing, I echo the perspective of Smith et al. (2002, p.47) who argue that "labour process dynamics strongly influence wealth creation" and that there is a

need to better understand the role of "labour in the production, circulation and realization of commodities". In this sense, this thesis contributes to exhortations to address the role of labour (Coe et al. 2008a; Rainnie et al. 2011; Selwyn 2012; Coe & Hess 2013; Kelly 2013; Taylor et al. 2013) – in my particular case, informal labour (as discussed further in Chapter 6) – in the creation and constitution of value in the analysis of GVCs and GPNs.

The rest of this section, I first discuss the false binary between waste and value, and argue that waste is only a temporary state that permits the commodity to be discarded. This state of being 'waste' is only temporary as once it is bought by or picked up by *karung guni*, e-waste is no longer 'waste' but is once again of value in the eyes of *karung guni* who see value in that 'raw material'. Second, I differentiate the practices through which this 'waste' is valued: first, through the practices of dismantling and then subsequent sale of working components to local electronic and electrical repair shops; and second, through the sale in bulk of non-working components to e-waste wholesalers and e-waste recycling firms for the recovery of precious metals. In this sense, "waste or discarded goods become resources recovered for further rounds of commodity production in another" (Crang et al. 2013, p.12). In sum, this section puts forward the argument that waste embodies value. Emerging from this recognition, a greater appreciation of the politics, practices and processes in value (re)creation, enhancement and capture that occur *post*-consumption in global production networks can be analysed.

Throughout this discussion I continually highlight the inherent value in e-waste, whilst paying keen attention to the important role that labour – in particular,

*karung guni* – plays in this process of value creation. A key concept in this discussion is that of 'congealed labour' (Herod et al. 2014) or what I term 'latent use value'. Whilst congealed labour may be understood to be the value that is "incorporated during previous rounds of work" (Herod et al. 2014, p.425), I use the concept of latent use value to indicate that there is residual use value inherent in the commodity, even after it has been apparently exhausted of all value – or devalued in other words. Here again, Herod et al.'s (2014) differentiation of devalorisation and devaluation is informative; they argue that devalorisation is "the instance of a component coming to the final end of its life because it can no longer physically be recycled", whilst devaluation is the situation whereby "a component is no longer recycled simply because is it *not profitable* to do so under current circumstances, … *there is still value* that it could potentially bring with it if it were to be used as raw material for new commodities being fabricated in a GPN" (Herod et al. 2014, p.428 emphasis mine; see also Herod et al. 2013). Importantly, Herod et al. (2014) argue for the need to look at the flows of value embodied in a commodity, a view that echoes an approach to studying commodities as suggested by Smith et al. (2002), who emphasised the need to look at the flows of value embodied in the commodity rather than concentrate on the semiotic transformations and geographical movements of the commodity itself.

As argued earlier, waste is not in opposition to value, but rather is constituted by it. When does a commodity become 'waste'? This transformation from commodity to 'waste' occurs the moment a consumer decides that the commodity is to be replaced, discarded or is obsolete – hence creating e-'waste' (see Lepawsky & Billah 2011). 'Waste' is created when a commodity has become something of no or

little value to the owner simply because it is no longer desired or wanted or indeed no longer performs a use. This marks the beginning step in the process of 'waste' production, and is the precursor to the next step of collection by *karung guni*. Indeed, *karung guni* – who are armed with a particular way of valuing – view e-waste through a lens different from that of the consumers who discard their obsolete and/or broken electronic and electrical products. For *karung guni*, e-waste – in spite of being discarded or unwanted by previous owners – embodies value, and this is demonstrated in two distinct ways. First, in the very act of wanting to acquire the e-waste from owners who wish to discard their e-waste, *karung guni* demonstrate that there is an already existing value to e-waste. The value of e-waste is seen in the economic potential that *karung guni* identify in e-waste, either to be sold on as cannibalised reusable components or as recyclable e-waste components. Second, through the act of purchasing e-waste from the owners for a nominal sum of money, *karung guni* value e-waste that is purchased. In this regard, the purchase of e-waste may be conceptualised in a similar manner as the purchase of raw material for production. This recognition of value embodied within e-waste is aptly understood by Sheppard and Barnes (1990, p.37) as "validation through exchange", a process which supports Marx's (1956) conception of exchange value, since a commodity is of no exchange value until it is actually traded through the market. In a similar way, *karung guni*, through their purchase of e-waste from households and small and medium firms, validate the exchange value of e-waste when they pay an amount of money in return for e-waste. For example, UKGSgp #4 argued that he is very careful in his purchase of e-waste, and tries to look out for those that he knows will give him a higher return:

> Of course I don't buy e-waste that has little value to me! I am not crazy you know… I am also not a garbage collector. Sometimes people sell computers with Pentium 3 or Pentium 2 processors. Those are so old, there is little value in them, except for scrap. What I really want are CPUs that are only about three years old, complete with the hard drive. These often have salvageable components that I can sell on to component refurbishing shops, or to computer servicing shops in Sim Lim Square. They are much more valuable.
>
> (Interview with UKGSgp #4, Singapore)

In addition, *karung guni* purchasing e-waste from households and small and medium firms reinforces the notion of validation and valuation through exchange. This is demonstrated by the differentiation that *karung guni* make between the different prices given for computers according to the processors that were used in their assembly unit. According to UKGSgp #4, the more up to date the technology of the CPU, the greater amount he is willing to pay. UKGSgp #4 further explained that for computers running on processors that are more than five years old, he would pay around SGD 10 – 15 (≈ USD 8 – 12) for the unit, whilst those running on more up to date processors would be valued around SGD 35 – 40 (≈ USD 28 – 32). In addition, during my accompanying *karung guni* on their collection rounds, it was observed that *karung guni* often asked if the computers still had its hard drive inside it. This factor was important in contributing to the value of the computer unit. If the owners had taken out the hard drive – either due to data security concerns or personal reasons – the price offered by *karung guni* would be lower. When probed further about this practice, all 46 *karung guni* in Singapore said that the absence of the hard drive would bring down the price offered by an estimated 25% – 35%.

Another concern of *karung guni* was whether the computer was working or in a repairable state, or if it was being discarded because it was not working anymore. According to KGPng #12, if the CPU is not working, the likelihood it has parts which are reusable or which can be cannibalised and sold directly to local computer refurbishers is significantly lower. This in effect would lower the value of the e-waste as a result of having lower subsequent valuations. This echoes Zoeteman et al. (2009, p.423) who argued that "parts cannibalization… usually recover more value than just the materials" and can lead to higher levels of profitability for actors who are able to find working e-waste components for reuse (see also Davis & Wolski 2009; Johansson & Luttropp 2009). As has been argued by Crang et al. (2013, p.15), "it is assessments of material quality that enable value to be realised in used goods – finding and separating the good quality components or materials", and indeed, the evidence from the regional e-waste recycling network demonstrates the stark value differentials between more valuable working components, and those which are non-working. According to all 46 *karung guni* interviews in Singapore, and 41 interviewed in Malaysia, a key determinant of the price they pay the owners for their e-waste is the subsequent amount of money that *karung guni* can receive for selling the working and non-working components to electronic and electrical repair shops and e-waste wholesalers downstream (see Figures 4.1 and 4.2). What is key in this process of rationalisation by *karung guni* is that they are thinking through the market as rational economic actors, rather than being haphazard in their purchase of e-waste. This process of price and value formation involving *karung guni*, the original owners of e-waste, electronic and electrical repair shop owners, and e-

waste wholesalers highlights the social relations that surround the processes of valuing and of measuring value (Lee 2006, see also Lee et al. 2004).

Value in e-waste is derived from the previous rounds of congealed labour that is still embodied in e-waste (Herod et al. 2013; Herod et al. 2014). Exchange value can still be found in e-waste from the point when *karung guni* purchase e-waste from its owners. Latent use value – which is the basis of the exchange value – is also found within e-waste, and it is this latent use value that is acted upon by labour (*karung guni*) to create more value in e-waste. *Karung guni* who purchase e-waste from households and small commercial offices cart the e-waste to their homes to disassemble, sort and package in sufficient quantities to sell on to e-waste wholesalers. In addition, *karung guni* cannibalise e-waste to salvage various components that are still in a working condition to sell on to electrical and electronic repair shops, including computer servicing shops, and mobile phone repair shops. KGPng #13 argued that the sale of working components to local electronics and electrical repair shops was a good source of revenue, and provided even higher returns than if he sold the components to e-waste wholesalers:

> I sell the working parts to a couple of repair shops in the city centre. It is a good source of money since they pay more to me compared to just selling it to e-waste wholesalers. The difference is between 15% to 20% more than what I would be paid if I sold it as recycled materials. But I must also make sure that the parts are working. If they are not, then the repair shops will not buy from me anymore.
>
> (Interview with KGPng #13, Penang)

Although the sale of working components to repair shops yields greater returns, technical ability to test the components is required. The requisite knowledge

concerning electrical circuitry and the functioning of electrical and electronic products, and the ability to decipher which components of e-waste are working, is a complex skill set that not all *karung guni* possess. Out of 46 *karung guni* in Singapore, 42 engage in the sale of working components to repair shops, whilst only 26 out of the 41 *karung guni* in Malaysia actively sold to repair shops.

The use value of the components that are cannibalised from e-waste that are in working condition can be used by electronics and electrical repair shops who utilise these components to fix damaged electronic and electrical products. Hence, latent use value in e-waste is realised as exchange value through the *labour process*. Hence, if we do not conceptualise e-waste as embodying latent use value, from what and from where then would *karung guni* create value that is embodied by the working and non-working components that are subsequently sold on?

An analysis of the e-waste circuit of capital finds its foundation in an appreciation of the labour process as crucial to the creation of value (see Figure 5.1). Without the labour process – focussed around the collection, dismantling and sorting of e-waste by *karung guni* – the functioning of the regional e-waste production network in Malaysia and Singapore would not be possible. The role of the labour process is critical to the creation of value (Marx 1956; Smith et al. 2002; Herod et al. 2014). Lepawsky and Mather (2011) similarly highlighted the role of labour in recycling and giving a new lease of life to commodities that had been discarded by their previous consumers. Moreover, the second round of labour process (the process of recycling by *karung guni*) would not be possible without the earlier rounds of labour process, that resulted in the congealed labour embodied in the commodities

that were subsequently sold on the market, consumed and then discarded. The latent use value embodied by e-waste – the 'raw material' – is the product of congealed labour from previous rounds of the labour process that have not been exhausted by previous rounds of consumption. In addition, labour plays a central role in *identifying* value, as seen in the purchase of e-waste from households and small and medium commercial firms by *karung guni* who are able to appreciate the value in e-waste.

In this section, I have analysed the false binary that exists between waste and value, and have argued that waste is intimately bound up in circuits of value, in particular through its embodiment of latent use value that enables it to be of value to *karung guni* who are able to realise the exchange value potential still present in e-waste. In addition, I have discussed the importance of the labour process in the creation of value, and how congealed labour, or latent use value, forms the foundation for the continued valuation of e-waste.

In the next section, I analyse the ways in which informal sector *karung guni* transform e-waste into raw materials by focussing on the economic activities and practices of *karung guni* and informal wholesalers. Importantly, section 5.3 highlights the main functions of *karung guni* in the regional e-waste recycling network in Malaysia in Singapore: (1) collecting; and (2) disassembly, dismantling and sorting. Informal e-waste wholesalers are highlighted in section 5.3 for the bulk collection and sorting activities. With reference to Figure 5.1, the processes discussed in the next section are from Stage 1 to Stage 9.

## 5.3 Transforming E-Waste into 'Raw Material'

The informal sector, replete with its diverse forms of production, is articulated in many ways with the capitalist mode of production (Bose 1998; Ojeda-Benitez et al. 2002; Guha-Khasnobis et al. 2006; Williams 2009; Castel & To 2012; Kurfurst 2012; Williams & Windebank 2012; Katusiimeh et al. 2013). The activities that the informal sector – in this case, *karung guni* – perform are significant to the functioning of the e-waste recycling network. *Karung guni* are dominant in the activities of collecting, disassembly and sorting of e-waste components, and the downstream actors in the regional e-waste recycling production network in Malaysia and Singapore are heavily dependent on the labour of *karung guni*. In this section, I interrogate the productive activities of *karung guni* and informal e-waste wholesalers. I highlight their central importance to the value (re)creation, enhancement and capture potential of other actors in the network, and also to the overall development and structure of the regional e-waste recycling network. In contrast to the relatively descriptive discussion on the input-output structures of the e-waste recycling networks in Malaysia and Singapore in section 4.1, this section emphasises the processes of value creation, enhancement and capture by *karung guni* and informal e-waste wholesalers. Although the articulation of the informal sector in the e-waste recycling network in Malaysia and Singapore varies slightly between the two contexts (due mainly to different socio-political environments in Malaysia and Singapore), their core activities are similar, and can be understood in three main areas which are central to the very functioning of the

regional e-waste recycling network: (1) collecting; (2) disassembling, dismantling and sorting; and (3) wholesale.

### 5.3.1 Collecting

The collection of e-waste by itinerant waste buyers is the pivotal point in understanding the revalorisation of waste by *karung guni* (see Figure 5.1, Stage 1). E-waste produced by households and small commercial firms are purchased by *karung guni*, who through the exchange, highlight the latent value in the e-waste that they purchase. This collection of e-waste by *karung guni* is essential for the subsequent processes in the e-waste recycling network, and several e-waste recycling firms have attempted to copy the collection geographies of *karung guni*, but to very low levels of success (see Bunnell et al. 2011). Without *karung guni* going around to purchase e-waste from households and small and medium firms, there is a significant pattern of either discarding e-waste indiscriminately, or keeping the e-waste in homes and offices in drawers and in corners, thus losing out on the recycling potential of these materials.

*Karung guni* are essential to the process of collection because of two reasons. First, they are a large number of independent petty commodity producers who scour their areas on a regular basis to collect e-waste. Second, they have an established foothold in the community as purchasers of waste and are the preferred people to whom e-waste is sold. Several municipal solid waste (MSW) firms in Singapore argued that although they are required in their contracts to provide recycling services to households which they service, the volumes are often low; and even in

cases where the recycling bins in estates are overflowing, they are filled with mixed waste that is not properly sorted into proper recycling waste streams (MSWFSgp #1, #2, #3, #4). Many households refuse to pass their recyclable materials to the municipal solid waste firms or commercial recycling firms, choosing instead to sell it to *karung guni*. Indeed, *karung guni* perform a critical function in the regional e-waste recycling network through their collection of e-waste. FRERSgp #2 shared that they had attempted to operate their own collection rounds, but gave up after their pilot project, due to poor responses from the public:

> *Karung guni* do very important work in collecting old televisions and other electronic products from households. We do not have the same network that they have, and they are already familiar with the residents who are willing to sell to them.
>
> (Interview with FRERSgp #2, Singapore)

The difficulties involved with attempts at copying the collection networks of itinerant waste buyers were similarly highlighted by three other managers of e-waste recycling firms in Singapore, and two in Malaysia. In addition, any attempts at copying *karung guni* collection networks would also increase the operating costs for e-waste recycling firms by requiring increased manpower and the purchase of tools and machinery, however rudimentary. This point underscores the established nature of the collection networks of *karung guni*, and how they have managed to become socially embedded within the communities that they serve. In addition to the collection networks, *karung guni* also visit on a high frequency, since each housing estate is not serviced by only one *karung guni*, but rather has several of them going through an estate at different times of the day throughout the week. This is in contrast to the collection routines of municipal solid waste

collectors in Singapore who only collect recyclable paper, glass and plastics (not e-waste), and who do so only once a week or fortnight (see Figure 4.7). Similarly, Neo (2010) found that many government-led recycling initiatives in Singapore, under the auspices of the National Recycling Programme, did not take into account the role of informal itinerant waste buyers.[6] GvtSgp #2 recounted the difficulties faced by municipal solid waste collectors:

> They [*karung guni*] provide a service that we cannot. We tried encouraging households with our door-to-door fortnightly collections, but then *karung guni* go every week, and there are so many of them, that one home can get multiple *karung guni* going there in a week, even in a day. They [the households] also rather sell it to them since they get money for selling their discarded items… they get no money from us.
>
> (Interview with GvtSgp #2, Singapore)

There is indeed latent value in the e-waste that is purchased by *karung guni*. The sale of e-waste and recyclable material to *karung guni* does not present itself as a problem to the government, and has in fact been seen in a positive light, leading to the passive enforcement of regulations and licensing requirements on *karung guni* by authorities in Singapore (see section 4.3.2). One of the most distinct effects of regular visits by *karung guni* has been the lower levels of rubbish collected by municipal solid waste collectors. GvtSgp #6 suggests that *karung guni* are actually active agents in reducing the amount of household waste that is sent to the incinerator:

[6] Similarly, Ezeah et al. (2013) and UN-Habitat (2013) argued that informal waste collectors continue to play key roles in the management of municipal solid waste in cities in developing countries.

> Although *karung guni* cause some problems for our MSW collectors who are required by contract to collect recyclable waste from households, especially when they get into scuffles about who can stake claim to the rubbish, we have actually noticed that in areas that are regularly serviced by *karung guni*, there is a marked difference in the amount of rubbish that is sent to the incinerator.
>
> (Interview with GvtSgp #6, Singapore).

This reduction in amount of rubbish collected by contracted waste collectors is similarly observed in Malaysia. GvtMys #2 contended that:

> Estates where there are many *karung guni* operating, the incidence of dumping of old refrigerators, televisions and other electrical products is much lower. I am quite certain that it can be linked directly to the collecting activities that *karung guni* do, and that residents are able to get back money for their e-waste, rather than run the risk of being fined by one of our officials for illegal dumping.
>
> (Interview with GvtMys #2, Putrajaya)

From the perspective of the government, the activities of itinerant waste buyers aid in reducing the amount of waste that is sent to landfill or incineration, and because it is separated at source, provide valuable materials that can be recycled and re-introduced into manufacturing and production. In addition, it was suggested by several e-waste wholesalers, both formal and informal, that itinerant waste buyers are their primary source of e-waste, and this ranges from 85% to all of the e-waste that they sell wholesale subsequently. FEWSgp #5 encapsulates the sentiments of 8 of the 11 e-waste wholesalers in Singapore, and 12 of the 14 e-waste wholesalers in Malaysia when he argued:

> My e-waste… if not for *karung guni*, I might as well close down. They are the backbone of my supply. If they stop collecting, I will lose between 90% to 95% of my supply. I know there are other wholesalers who are entirely dependent on a group of *karung guni*… they have a special relationship, and it is hard to 'steal' *karung guni*

> away from another wholesaler once they have a strong business relationship.
>
> (Interview with FEWSgp #5, Singapore)

This finding is similar to that of Hieronymi et al. (2012, see also Streicher-Porte et al. 2005; Chi et al. 2011; Kreibe 2012) who highlight the importance of the informal sector in the collection of e-waste on a global scale.

### 5.3.2 Disassembly, Dismantling and Sorting

After collecting e-waste from households and small commercial firms, *karung guni* disassemble and dismantle – in their homes or along the roadside – the e-waste into their component parts, and then sort them accordingly (see Figure 5.1, Stage 2 to Stage 4). The geography of *karung* guni activities are important and are a potential source of tension because of the interwoven nature of home-space and work-space. This is discussed further in section 6.3.4. E-waste is generally separated into categories such as plastic casings, aluminium casings, copper wires, circuit boards, capacitors, resistors, and silicon chips. These are then placed in bags or boxes until a sufficient volume is accumulated, or until individual *karung guni* need to sell the primary processed e-waste so as to ensure sufficient cash flow to continue purchasing 'raw' e-waste. This process of dismantling and sorting is very important for downstream actors in the e-waste recycling network, as it improves the efficiency and productivity of the e-waste recycling firms. For example, Shekdar (2009) emphasised the importance of hand sorting of solid waste in Asia, arguing that this practice formed the basis for more efficient practices of recycling and reuse because the waste materials were separated into

distinct streams and could be managed more effectively and efficiently. This practice of dismantling and sorting by *karung guni* can be conceptualised as a form of disguised wage labour that contributes to the profitability of the e-waste recycling firms while remaining outside the direct employment of these firms (see section 6.2.1). FRERSgp #1 argued that *karung guni* are vital to his business as they manually dismantle and sort e-waste, a process that reaps far superior output compared to mechanical processors:

> There is a great amount of cost-saving for us from the sorting that *karung guni* do… They essentially make it easier for us to put e-waste into our crushers, and be assured that the crushed materials that emerge are of a high quality. Hand sorting is something that can never be replicated by mechanical sorting methods, even today. If we were to do the dismantling and sorting in-house, our operational costs would rise significantly.
>
> (Interview with FRERSgp #1, Singapore)

Indeed, the dismantling and sorting that is performed by *karung guni* is a significant value creation process, and reduces the financial commitment by e-waste recycling firms. A running conclusion might be that *karung guni* may be understood as 'disguised wage labour', insofar as they are a form of 'flexible outsourced labour' (Rainbird 1991). As disguised wage labour, this arrangement in effect permits the e-waste recycling firm to engage in significant cost-savings as it does not need to pay wages and pensions, negotiate with unions, or provide employment benefits to the *karung guni*. A key concern highlighted by many interviewees was the need to employ many more staff if *karung guni* had not been involved in the disassembly, dismantling and sorting of e-waste. FRERSgp #4 suggested:

> Without what *karung guni* do for us, we would have to employ many more staff to manually dismantle all the e-waste that we receive. That would not only be time-consuming, but also very labour intensive… What they [*karung guni*] do is really essential for us, and it increases our downstream productivity since we save on having to go through more rounds of sorting.
>
> (Interview with FRERSgp #4, Singapore)

The functions of *karung guni* are thus quite considerable, especially in the processes of dismantling and sorting of e-waste. In addition, *karung guni* do not function merely as providers of means of production for e-waste recycling firms, but occasionally serve as outsourced labour for e-waste recycling firms when they manage to attain large orders of e-waste for disposal. In the first instance, *karung guni* are disguised wage labour for e-waste recycling firms by selling the collected, dismantled, disassembled and sorted e-waste to wholesalers who subsequently sell this on to e-waste recycling firms. In the second instance, *karung guni* are occasionally paid by e-waste recycling firms as outsourced wage labour to perform the same duties of dismantling, disassembly and sorting. However, the difference in this instance is that *karung guni* have sold their labour power to the e-waste recycling firms, and in effect are receiving a wage for their work. Also, this second instance removes from *karung guni* the ownership of the means of production (i.e. e-waste), since the e-waste is owned by the recycling firm and not by *karung guni* themselves. FRERSgp #2, general manager of an e-waste recycling firm in Singapore, argued:

> Sometimes, we also sign contracts to dispose of e-waste from large commercial locations, and if we are lucky, we can get big government contracts through GeBiz [Singapore Government

> Electronic Business website][7] to dispose of their e-waste. Quite a few times we have outsourced the dismantling, sorting processes to some *karung guni*. We of course pay them more, but they save us the manual labour involved in breaking down the computers and monitors and printers and copier machines into component parts,… it allows us to get on with what we are best at.
>
> (Interview with FRERSgp #2, Singapore)

In this sense, *karung guni* are also articulated with e-waste recycling firms as a source of labour for them when they acquire e-waste that is still not dismantled and sorted. Importantly, in their relations with e-waste recycling firms, such as FRERSgp #2's firm, *karung guni* are both informal labour (in the sense that they are not directly employed by the firm and work independently), but they are also a reserve army of wage labour who provide outsourced services to downstream actors.

Six out of 20 Malaysian e-waste recycling firms (both partial and full recovery) and 8 out of 14 Malaysian e-waste wholesalers reported that they travel down to Singapore to buy e-waste and then transport it via trucks to Malaysia for dismantling by the informal sector. Indeed, even Singaporean e-waste recycling firms have been known to send e-waste to Malaysia for dismantling and sorting by the informal sector, before having it sent back to Singapore to be processed at the e-waste recycling facility. UKGSgp #12, *karung guni* in Singapore with twelve years experience, stated:

[7] GeBiz is a website run by the Singapore Government for the publication of tenders for government contracts and for suppliers to conduct e-commerce with the Singapore government. Available at: www.gebiz.gov.sg [Accessed: October 24, 2013].

> There are many e-waste wholesalers from Malaysia who come down to Singapore to purchase unprocessed e-waste and then transport it to Malaysia to dismantle and sort. The labour cost is much cheaper in Malaysia and they are able to have many more people do it, so the work is also faster. Some e-waste recycling firms in Singapore actually outsource this process to have it dismantled by small operators in Malaysia to save them on costs related to the dismantling and sorting process.
>
> (Interview with UKGSgp #12, Singapore)

The movement of unprocessed and primary processed e-waste across the border from Singapore to Malaysia and then back to Singapore is indicative of the connections between the e-waste recycling industry in Malaysia and Singapore, and points towards the global nature of e-waste recycling.

The value of dismantling and sorting by *karung guni* is not only of importance to e-waste wholesalers and e-waste recycling firms, but is also significant to government agencies that manage waste disposal, as seen in the case of Singapore, where GvtSgp #6 shared the statutory board's general attitude of passiveness towards *karung guni*, shedding light on the positive aspects of *karung guni* work:

> … we are generally tolerant of *karung guni* because their work involves dismantling and sorting a lot of recyclable waste from households and SMEs [Small and Medium Enterprises]… and they sell it to specialist recycling wholesalers… paper, or glass, or aluminium cans, or electronic waste components. Their sorting work reduces the burden on the MSW collection system in providing recycling services beyond what is essentially our primary concern… which is the disposal of household waste that can cause big problems in terms of hygiene and sanitation.
>
> (Interview with GvtSgp #6, Singapore)

Disassembly, dismantling and sorting of e-waste is thus a critical function performed by *karung guni* that is considered to be of high value by actors in the e-

waste recycling network. Importantly, in this section I have highlighted how *karung guni* may be understood as a form of disguised wage labour, and that their relations with e-waste recycling firms are not as straightforward as simply selling them dismantled, disassembled and sorted e-waste, but also includes the sale of their labour power as well when recycling firms outsource the dismantling, disassembly and sorting functions to them.

### 5.3.3 Wholesale

Referring to Figure 5.1, the practices of wholesale are indicated in Stage 5 to Stage 9. Among the wholesalers to whom *karung guni* sell their primary processed e-waste to, fieldwork evidence suggests that around 40% of them are not registered with the government authorities, and are thus operating outside of government regulation – a position that would render them as informal according to the definitions set by the government authorities. As such, I have sought to compare the functions of these informal e-waste wholesalers with those operating in the formal sector. Several e-waste recycling firms cited the importance of informal e-waste wholesalers to ensuring lower costs (FRERKul #2; FRERPng #2, #3; FRERSgp #1, #3, #7; PRERKul #6; PRERPng #5; PRERSgp #1, #2). Due to their informal and undocumented status, informal e-waste wholesalers generally sell their primary processed e-waste at a discounted price of around 5% compared to the prevailing market price, and buy primary processed e-waste from *karung guni* at a price that is marginally higher than that paid by formal e-waste wholesalers (IEWKul #1, #2; IEWPng #1, #3; IEWSgp #1, #2, #5). IEWSgp #5 argued that this

situation was only possible because he did not have the overheads that came with licensing and auditing requirements:

> I buy from *karung guni* at around 2% higher than what they get at the other [formal] e-waste wholesalers. If I don't do this, no *karung guni* will sell to me… I always only use cash… *karung guni* prefer cash. Because I operate without a government license, all my transactions are in cash. E-waste recycling firms use my informal status as a way of paying me less… around 5% lower than the market rate. I make enough money just by stockpiling the e-waste till the price is good enough for me to sell. What else can I do?
>
> (Interview with IEWSgp #5, Singapore)

Although it may appear that informal e-waste wholesalers make a lower profit per unit sold in comparison to their formal sector counterparts, it must not be forgotten that formal wholesalers have to deal with more significant overhead costs that informal wholesalers are relatively less burdened by. In spite of this, informal wholesalers still manage to make a profit due to the high volumes that they handle (IEWSgp #2, #3, #5).

Taken together, e-waste wholesalers perform an important role for e-waste recycling firms, especially when they are seeking to purchase a large amount of primary processed e-waste at short notice. By reducing the number of suppliers that they need to deal with to fulfil their orders, e-waste recycling firms are better able to bargain with e-waste wholesalers, and thus get a more favourable price (see also section 4.2). FRERSgp #1 suggested:

> Our job is made much easier by buying primary processed e-waste from a handful of wholesalers… much easier to negotiate with two suppliers than to handle many many *karung guni*,… all selling only a few computers each. We can also bargain for a lower price, since we

> are buying in bulk…. we just buy directly from the wholesaler and they send it to us.
>
> (Interview with FRERSgp #1, Singapore)

Approximately 80% of the e-waste recycling firms interviewed stated that they relied exclusively on wholesalers for their inputs, presumably a result of the ease in acquiring primary processed e-waste from wholesalers. In fact, several e-waste wholesalers in Malaysia who sold primary processed e-waste to recycling firms in Penang and Kuala Lumpur stated that they too went through wholesalers to buffer their own stocks, or when they needed to meet orders that were larger than their stockpile (see section 4.1). FEWKul #1 stated:

> Wholesalers in Singapore are important to me as they allow me to buy in bulk to bring back to Malaysia,… much easier and more convenient than buying small quantities from individual suppliers or *karung guni*.
>
> (Interview with FEWKul #1, Kuala Lumpur, Malaysia)

In summary, the functions of the informal sector, as seen through itinerant waste buyers and the informal e-waste wholesalers, are critical to the overall operations of the e-waste recycling network in Malaysia and Singapore. Indeed, these findings reinforce those found in Africa (Osibanjo & Nnorom 2008; Grant & Oteng-Ababio 2012; Oguntoyinbo 2012) and China (Liu 2006; Yu et al. 2010), and underscore the articulations of the informal sector in global and regional e-waste recycling networks (see Chapter 6). In addition, the findings in this section reiterate the strategic role of *karung guni* in value creation processes. In summary, I have argued that *karung guni*, through their collection, dismantling and sorting of e-waste, are constitutive of the regional e-waste recycling network in Malaysia and Singapore, and are pivotal to the processes of value (re)creation.

In the next section, I analyse the non-contractual nature of transactions between various actors in the regional e-waste recycling network, and unpack the effects these social relations have on the opportunities and potential for value creation, enhancement and capture amongst the various actors. The non-contractual nature of relations in the regional e-waste recycling network in Malaysia and Singapore is significant in affecting their access to reliable supplies of e-waste (at various stages of processing). Importantly, I argue that upstream suppliers are often compelled to internalise risk, thus potentially suppressing their capacities for value capture.

## 5.4 Non-Contractual Relations

A significant portion of the trade that occurs within the e-waste circuit of capital in Malaysia and Singapore is facilitated through non-contractual relations, and is thus not legally binding (see in particular Figure 5.1, Stages 5 and 9). This element of uncertainty creates mutual suspicion and scepticism among actors in the regional e-waste recycling network. The non-contractual nature of trade results in increased levels of demand flexibility from downstream actors (e-waste recycling firms), and simultaneously allows them to be able to switch between suppliers without encountering significant costs. The ability of downstream actors to adjust input levels without having to stockpile reduces the burden on warehousing, hence lowering operating costs. I argue that related to unpredictable trade volumes, upstream suppliers (*karung guni* and e-waste wholesalers) are often made to

internalise risk, and thus potentially capture less value than would be the case if there were legal contracts of orders between parties.

In the segment of the e-waste circuit of capital that is under analysis here, non-contractual trade is seen most often between *karung guni* and e-waste wholesalers (see Figure 5.1, Stage 5); and e-waste wholesalers and e-waste recycling firms (see Figure 5.1, Stage 9). The only transactions in this segment of the e-waste circuit of capital which are marked by high levels of legally binding contracts are those between e-waste recycling firms and product manufacturers (see Figure 5.1, Stage 13), and are directly related to the need for e-waste recycling firms to meet the complex technical requirements of product manufacturers. E-waste wholesalers often use the flexibility of purchasing from a large network of *karung guni* to their advantage, and effectively reduce the ability of *karung guni* to capture more value through increased competition between *karung guni* that depresses the prices that are paid to them. *Karung guni* often directly approached e-waste wholesalers, who would ask them at what price they would sell the primary processed e-waste (KGKul #4, #15, #18; KGPng #7, #12, #19; LKGSgp #2, #5; UKGSgp #12, #16, #22, #30, #34; see also Figure 5.1, Stage 5). This involved face-to-face bargaining, and deals were made with a few minutes spent bargaining about prices (FEWSgp #1, #4; IEWSgp #1, #3; UKGSgp #2, #6, #16, #29; LKGSgp 3, #5). Of particular note was the way in which e-waste wholesalers leveraged their position in the network to increase their value capture. For example, several e-waste wholesalers would start at a price that was significantly below that which *karung guni* were asking for. This could vary from 50% to 60% of the price asked for by *karung guni* (FEWKul #1; FEWPng #1, #2; FEWSgp #1, #3, #4; KGKul #1, #7, #17; KGPng #2,

#8, #19; UKGSgp #5, #8, #23). The wholesalers would then suggest to individual *karung guni* that if they were not pleased with the price, they could take their wares to another wholesaler. Often, the final price agreed would be around 85% to 90% of that which *karung guni* initially suggested. For example, FEWSgp #4 shared that:

> I tell them the price, if they don't like it, they can go to another buyer. But there are not that many of us in Singapore. I also need to make a living. We usually can come to a mutually agreeable price. I have not had many experiences of them [karung guni] refusing my offers.
>
> (Interview with FEWSgp #4, Singapore)

FEWSgp #4's quote demonstrates the ability of e-waste wholesalers to take advantage of their position in the network to increase their value capture by driving down the price paid to *karung guni* for the primary processed e-waste. Due to the concentration of e-waste wholesalers in specific regions of Singapore, they are able to easily communicate with each other about prices (FEWSgp #1, #2, #4, #6; IEWSgp #1, #2, #3, #5). In addition, e-waste wholesalers in Singapore are acutely aware that e-waste recycling firms in Singapore would rarely purchase e-waste from *karung guni* directly, since *karung guni* would rarely accumulate sufficient sorted e-waste to fulfil the demands of the e-waste recycling firms (FEWSgp #1, #4; IEWSgp #2, #4, see also section 4.4). In contrast, some *karung guni* in Malaysia, although still operating within the same frame of non-contractual agreements, sell their primary processed e-waste directly to recycling firms because they are able to accumulate it in volumes that are sufficient for direct sale to recycling firms. These *karung guni* reported that this enabled them to get better

prices compared to selling to wholesalers, and recycling firms paid a lower price as compared to buying from a wholesaler, since both *karung guni* and recycling firms circumvented the need to go through an intermediary (FRERKul #1, #2; FRERPng #1, #4, #6; PRERKul #2, #4; PRERPng #1, #3; KGKul #1, #4, #17; KGPng #5, #8, #13, #18).

The non-contractual nature of transactions enables e-waste wholesalers to have greater control of their cash flows, and permits them to only begin purchasing primary processed e-waste from *karung guni* when they are assured of an order from e-waste recycling firms. In this instance, wholesalers who are cash-strapped are able to purchase primary processed e-waste which a recycling firm has already indicated a demand for, thus removing the need for the wholesaler to look for an additional line of credit. This in turn ensures that cash is in constant flow for the e-waste wholesaler, who thus is able to continue making profits through continued buying and selling of primary processed e-waste. E-waste wholesalers thus capture value in the e-waste circuit of capital through their non-contractual brokering between individual *karung guni* (whose primary processed e-waste on an individual basis is insufficient to meet the demand needs of e-waste recycling firms), and e-waste recycling firms (who benefit from outsourcing the need to stockpile and co-ordinate the wholesale trade in primary processed e-waste). FEWSgp #1 opined about the occasionally tight financial situations he has encountered:

> … I do not have much cash… my best solution is to make sure I have a buyer first. So I will go and look for them. We make an agreement on the total volume they want and what I can provide, and then

> agree on price… Sometimes it is ten tonnes of copper wires, sometimes much more. It all depends. … the most important is for me to find a buyer first, before I look for karung guni to buy from. Karung guni are in a similar tight economic situation as me, so we usually help each other, and agree on a price quickly, especially if we are old friends.
>
> (Interview with FEWSgp #1, Singapore)

Social relations of mutual confidence between 'old friends' are an important social lubricant to facilitate a quick and reliable trade of primary processed e-waste. However, FEWSgp #1's experience of being an e-waste wholesaler has not always worked to his advantage, especially in terms of the lack of a legally binding agreement. The lack of a contract between e-waste wholesalers and e-waste recycling firms often leaves wholesalers at the mercy of e-waste recycling firms. FEWSgp #1 had a couple of experiences where the e-waste recycling firm either decided that they no longer wanted the primary processed e-waste, or that they required a much lower amount, and only informed FEWSgp #1 when he was about to make the delivery:

> Twice it happened to me already… I had already agreed with the boss that I was going to deliver to him ten tonnes of copper wires, then at the last minute he called me and told that he didn't need it anymore. I had quite a bit of money stuck like that. I had to find another buyer quickly. Luckily I could find someone two days later. Another time, I had an order of copper wires, then just before I made the shipment, he called to say he only wanted half. I just don't trust them anymore. So I don't sell to them anymore.
>
> (Interview with FEWSgp #1, Singapore)

In addition, non-contractual transactions do not always only benefit the downstream actors (e-waste recycling firms) in the network. Downstream actors are reliant on the ability of their suppliers to provide them their input materials in

a timely fashion, and at volumes that are agreed upon. There were several instances where some *karung guni* manipulated this reliance by e-waste wholesalers on *karung guni* for their primary processed e-waste by turning the non-contractual arrangement to their advantage (UKGSgp #8, #14, #26, #29, #31, #37, LKGSgp #3). In these instances, although they had already made verbal agreements with e-waste wholesalers to sell to them agreed upon volumes of primary processed e-waste, they would either sell smaller volumes or inform the wholesaler that the agreement was no longer to be honoured. In some cases, *karung guni* who knew that they were providing a significant portion of the order that the wholesaler required, used the dependence of the wholesaler as leverage to increase their value capture. UKGSgp #9, a *karung guni* in Singapore, with twenty years in the trade, stated:

> … I also know how to make sure that I can get my fair share of the money. They ask for one tonne [of microchips], I know I can provide… so I agreed. I found out later on that he was paying me much less than he was paying to another *karung guni* who was only providing him with two hundred kilos, so I told him, he can go and ask the other one to get for him all of it… about an hour before … He had no choice but to raise the price… because I knew he was relying on me for a bigger portion of the order.
>
> (Interview with UKGSgp #9, Singapore)

Importantly, UKGSgp #9 demonstrated that *karung guni* are not helpless in the regional e-waste recycling network. Although non-contractual relations lead to uncertainty within the network, this feature of the organisation of the regional e-waste recycling network empowers actors with the ability to increase their value capture by seeking out relationships that are to their best advantage. To meet the uncertainties of these non-contractual relations, social relations of mutual

confidence become significant means to mitigate the negative effects of flexibility in the network. Social relations of mutual confidence between actors are built through repeated exchanges, whereby both parties in the trade feel that they have been treated fairly and received their goods and payment to a 'fair' level, however defined by the individuals involved.[8] Social relations of mutual confidence are key to facilitating the flow of capital in the e-waste circuit of capital. The growth of these relationships of mutual confidence is strongly related to the uncertainty that comes from the non-contractual nature of trade within this segment of the network. These relationships allow greater access to e-waste for value creation, or for greater opportunities for value capture. *Karung guni* who have built up a close relationship with households and small businesses would be the "preferred" *karung guni* to whom they sell their waste (see Figure 5.1, Stage 1). This "preferred" status gives *karung guni* temporary territorial capture over e-waste from those selected households and small businesses, and benefits *karung guni* as it enables them to have access to greater amounts of e-waste for collection and primary processing (see also section 6.3.7). For example, SMESgp #1 asserted that LKGSgp #4, is the only *karung guni* to whom she sells her broken or obsolete e-waste:

> LKGSgp #4 and I have known each other for very long. I started selling my spoilt monitors, printers and photocopying machines to him almost seven years ago… Today I sold six computers… two monitors… and one server to him. I don't use anyone else. LKGSgp #4 is reliable, at least I know he won't attempt to re-use the parts, and he gives me a good price for my junk. Today I received $120 [≈ USD 94.71],… just right to buy coffee and cakes for everyone in the office.

[8] Similarly, Hess & Coe (2006) argued that a high levels of trust was key to the structure and development of the mobile-telecommunications industry.

(Interview with SMESgp #1, Singapore)

SMESgp #1's relationship with LKGSgp #4 is an example of other social relations of mutual confidence that I observed between *karung guni* and households/small businesses (UKGSgp #1, #4, #17, #19, #25, #30; LKGSgp #2). Indeed, 44 out of 46 *karung guni* in Singapore reported that they have regular collection rounds from specific small and medium firms that they have established good relations with (see also section 6.3.7). In fact, many *karung guni* shared personal stories about how they had formed a friendship with clients who would wait for them to make their rounds in the estate to sell them their e-waste (UKGSgp #9, #14, #22, #27, #38; LKGSgp #1, #4; see also section 4.1). The use of social relations of mutual confidence as a means of negotiating the complex terrain of non-contractual transactions is also seen amongst *karung guni* and e-waste wholesalers who purchase the primary processed e-waste. FEWSgp #6 argued that over the years, he has built up a network of *karung guni* that he can rely on to sell him primary processed e-waste:

> When I first started, I thought I could just make as much profit as I can by making sure I paid only the lowest price to karung guni. But then, after all these years, I have made friends with many of them, and I can depend on them when I need to meet volumes which are demanded by my orders. If you treat them fair, they will want to do business with you… Usually I just need to give two or three days notice and I will be able to get it. This is all from knowing each other, building a relationship.
>
> (Interview with FEWSgp #6, Singapore)

Indeed, FEWSgp #6's experience of nurturing social relations of mutual confidence with *karung guni* was also the result of him being seen by *karung guni* as honest in

his dealings, whereby he gave a reasonable price to *karung guni*, and where *karung guni* similarly did not act in ways to jeopardise the quality of the primary processed e-waste (see section 6.3.6). A consequence of the establishment of social relations of mutual confidence has been the facilitation of mutually beneficial transactions between actors, whilst contributing to value creation opportunities by increasing the pace at which cash flows in the circuit. Between e-waste wholesalers and e-waste recycling firms, social relations of mutual confidence also feature importantly in their relationship and are closely linked to the reliance by e-waste recycling firms on the wholesalers to sell them primary processed e-waste that is of the quality that they purport.

Social relations of mutual confidence serve both as a means of facilitating the smooth flow of capital in the e-waste circuit of capital, and as the basis for co-operation and information sharing between actors in the regional e-waste recycling network. To illustrate this, I discuss briefly two instances where social relations of mutual confidence formed the foundation for activities that contributed to an increase in the value capture opportunities available to *karung guni*. First, *karung guni* in Penang often meet in coffee shops around the city, both to rest and to socialise with other *karung guni*. Of the 21 *karung guni* interviewed in Penang, only one mentioned that he did not regularly visit these coffee shops. In this case, social relations of mutual confidence and familiarity among *karung guni* is fundamental to the willingness to share information ranging from the prices of metals according to the London Metal Exchange (www.lme.com), the details of orders which local e-waste wholesalers have, reviews of experiences in trading with particular local e-waste wholesalers, and even experiences of harassment or

assistance from police officers. These exchanges of information are important to *karung guni* as they serve as a source of tacit knowledge about daily dynamics in the e-waste recycling industry. This information empowers *karung guni* with the knowledge of what prices are acceptable for their primary processed e-waste, which e-waste wholesalers may be willing to give a higher price for the primary processed e-waste since they have an order to meet, and which areas of the city should be avoided because the police officers patrolling that area are particularly hostile to *karung guni*.

In a second example, individual *karung guni* in Singapore often cooperate with other *karung guni* so that they are able to have a larger volume of primary processed e-waste to sell to e-waste wholesalers, in the hope of being able to negotiate a higher buying price. Social relations of mutual confidence between *karung guni* are important when cooperating with each other because it enables them to be sure that neither *karung guni* would jeopardise the quality of the primary processed e-waste by shoddy dismantling and sorting of e-waste. For instance, in the case of printed circuit boards, *karung guni* strip the circuit boards of all the transistors, resistors and capacitors and of the various microchips that may be embedded in the printed circuit board. E-waste wholesalers buy printed circuit boards – that have had the other components removed from them – according to weight. By being able to sell a larger volume to e-waste wholesalers, *karung guni* who work together are able to negotiate a higher price, ranging from 8% to 10% more than they would receive with a smaller volume (UKGSgp #3, #17, #34; LKGSgp #3).

In this section, I have argued that the non-contractual nature of trade in sections of the regional e-waste recycling network has increased the uncertainty that exists in this segment of the network and affects the ability of actors to capture value. Consequently, *karung guni* and wholesalers have engaged in establishing relationships that are based on social relations of mutual confidence to mitigate the negative effects of this non-contractual organisation of the network. The following section develops the line of discussion further, by assessing the strategies of accumulation employed by firms to increase their value creation and capture.

## 5.5 Strategies of Accumulation by Firms in the E-Waste Network

The critical role of *karung guni* to the creation of value in the regional e-waste recycling network is of little benefit to *karung guni* if they are unable to capture sufficient value for social reproduction and survival from the network. Given their geographically dispersed practices, and their need to go through a broker (the e-waste wholesaler) in the sale of dismantled and sorted e-waste, *karung guni* are placed in a precarious position in terms of securing income, with fluctuations in revenue according to the availability of e-waste being a common occurrence (see also Crang et al. 2013). However, *karung guni* are not the only actors in the regional e-waste recycling network to be impacted by the way in which power is distributed in the network to secure value. In a similar way, e-waste recycling firms pressure informal e-waste wholesalers into depressing their prices through strategies, including threatening to switch suppliers (see section 5.4). Indeed, the

ability of actors to capture value from the networks that they are articulated in is crucial to both their upgrading potential and their ability to accumulate capital (Bair & Gereffi 2003; Barrientos & Smith 2007; Barrientos et al. 2011; Coe & Hess 2013; Taylor et al. 2013), but importantly – especially in the case of *karung guni* – is also essential to their very ability to live on a day to day basis. In the following sections, I examine the four main strategies employed by e-waste recycling firms and wholesalers in Malaysia and Singapore in an effort to increase the value captured by them and to also re-negotiate the power relations within the regional e-waste recycling network that emerged through the research process. Section 6.3 will look at the social reproduction and survival strategies of *karung guni*.

Section 5.5.1 evaluates the role of investments in technology in improving the value creation, enhancement and capture opportunities of e-waste recycling firms. In section 5.5.2 I interrogate the practices and motivations of e-waste recycling firms who have sought to or successfully attained international standards certification to improve their product differentiation, and hence increase their access to markets. Section 5.5.3 probes the practice of hoarding and creating bottlenecks in the supply of e-waste by wholesalers, and how this practice influences the price of e-waste. In section 5.5.4, I highlight the importance of *karung guni* to e-waste recycling firms, and argue that recycling firms increase their value capture by externalising the costs and risks associated with the collection, dismantling, disassembling and sorting of e-waste to *karung guni*. These four strategies yield tangible gains in value capture for the actors who have engaged in them and are significant in influencing and re-organising the distribution of power in the regional e-waste recycling network in Malaysia and

Singapore. In addition, these strategies demonstrate the importance of a steady and predictable supply of e-waste to the continued survival and success of the actors in the regional e-waste recycling network.

### 5.5.1 Investments In Technology

The creation, enhancement and capture of value by actors can be increased through their investment in technology, which can act as a means for them to have access to more resources, or as a means to extract more precious metals from the material that is processed. Similarly, technology has had a profound impact on the productivity of e-waste recycling firms in Malaysia and Singapore. While the investment cost in technology is greatly different between *karung guni* and e-waste recycling firms, the objective is similar – to increase value creation, enhancement and capture. For e-waste recycling firms, major investments in technology are through the purchase and acquisition of new machines to replace obsolete technology, and to improve production processes (see Figure 5.1, Stages 10 and 11). Investment in machinery is key, especially that which performs high-tech processes, such as segregating crushed e-waste, or extracting recovered precious metals when in a molten state. Different approaches were undertaken by e-waste recycling firms in Malaysia and Singapore in terms of machinery. In Singapore, the means towards increasing the creation and capture of more value involved the acquisition of more advanced forms of technology, especially machinery that improved the separation and subsequent extraction of precious metals from e-waste. For example, FRERSgp #8 explained that his firm had invested an estimated SGD 3.5 million (≈ USD 2.75 million) in acquiring new

machinery to improve the quantity and purity of precious metals that they extract from e-waste:

> The purchase of new machines is part of our company's plan to increase our ability to provide high grade, high purity recovered precious metals to our customers, … this helps us in increasing our customer base. From our calculations, the new machines allow us to increase the effectiveness of the recovery of precious metals from around 70% to around 85%. What this translates to is an improvement in our productivity, as demonstrated both by an increase in the purity of the product that we sell, and an increase in the amount of precious metal we can recover from every metric tonne of e-waste.
>
> (Interview with FRERSgp #8, Singapore)

The increase in the value created and captured by the e-waste recycling firm becomes possible through acquiring machinery that is more efficient at sorting crushed e-waste (i.e. value enhancement), and machinery that is more effective in extracting precious metals from the crushed e-waste after it has been melted down.[9] In addition, the ability to provide recovered precious metals of a higher purity level increases the customer base of these e-waste recycling firms by reducing their reliance on precious metals refineries to improve the quality of the recovered precious metals to meet the requirements of product manufacturers. For example, FRERSgp #6 explained that the ability to meet the technical specifications of product manufacturers without being reliant on the services of

[9] One such machine is the eddy current separator, which three e-waste recycling firms in Singapore were ready to account as important towards their firm's productivity (FRERSgp #2, #3, #6). In Malaysia, the main methods used for the recovery of precious metals are wet chemical processes and electrolysis (FRERKul #1, #2; FRERPng #1, #3, #4, #6; see also Awang 2010).

precious metals refineries was the main motivation for his firm to acquire new machinery to meet these demands:

> … it became obvious to us that we were losing money to the refineries. We had the skills and the manpower to deal directly with product manufacturers and to meet technical requirements. We managed to increase our profits by almost twenty percent just by doing it ourselves.
>
> (Interview with FRERSgp #6, Singapore)

In Malaysia, e-waste recycling firms are located in industrial areas in plots that are two to three times larger than their Singapore counterparts. The increased area allows Malaysian e-waste recycling firms to increase output by purchasing more machines, and by having a larger area for storage of both processed and to-be processed e-waste. However, in spite of the availability of space, few Malaysian recycling firms vertically integrated in the way that their Singaporean counterparts did, and instead still relied on selling their recovered precious metals to precious metals refineries for further processing before being sold to product manufacturers. This was attributed to two factors: (1) the need for further licensing, which would increase costs, and thus depress profit margins; and (2) the significant initial costs related to purchasing more machinery which are expensive and would require a long time-horizon to recover (PRERKul #3, #6; PRERPng #1, #2).

Interestingly, 13 out of the 20 e-waste recycling firms interviewed in Malaysia stated that the machinery they acquired was from Singapore e-waste recycling firms. The sale of machinery from Singaporean e-waste recycling firms to

Malaysian firms results in the latter always lagging behind the former in terms of technological advancement and adoption. It also means that Malaysian firms are reliant on Singaporean firms for more advanced processes in the recovery of precious metals, as demonstrated by the significant number of Malaysian e-waste recycling firms that send their partially recovered precious metals to Singapore precious metals refineries and full recovery recycling firms for further processing before the precious metals are sold on to product manufacturers.

In this section, I have examined the adoption of technology by e-waste recycling firms as a key strategy to increase value creation, enhancement and capture potentials. A key difference between the practices of Malaysian and Singaporean firms is noted, with Singaporean firms being more willing to invest in more up-to-date technology as a means of increasing value capture, while Malaysian firms have tended to focus on their key competencies and increase value capture by increasing the volumes which they process. In the next section, I analyse the role of international certification as a strategy employed by e-waste recycling firms to improve their competitiveness and value capture.

### 5.5.2 International Certification

International standards certification has emerged as an important means for full recovery e-waste recycling firms to improve their value capture by expanding their customer bases.[10] International standards certification – employed to gain

[10] Debates concerning standards in global value chains and global production networks have been closely related to issues surrounding governance, upgrading,

competitive advantage – is a means by which e-waste recycling firms have sought to increase their value creation and capture opportunities by providing assurances to commercial firms on the safe and secure destruction of e-waste that is processed by the recycling firm. Certification contributes to firm competitiveness by increasing market access for the recycling firm, while also differentiating their services from other recycling firms. In addition, these certifications have also provided e-waste recycling firms with a measure of protection against legal action from clients by ensuring a minimum level of environmental management standards, quality standards, manufacturing standards and service delivery. 8 out of 20 e-waste recycling firms in Malaysia, and 13 of the 14 e-waste recycling firms interviewed in Singapore have sought ISO certification - mostly for ISO 14001, concerned with environmental management standards, and ISO 9001, concerned with quality assurance. Other international standards that are common amongst many of the e-waste recycling firms include OHSAS 18001, which is a British standard relating to occupational health and safety management, and international certification for good recycling practices from bodies such as e-Stewards and Responsible Recycling (R2). The importance of certification to e-waste recycling firms is seen in the significance that several customers attach to the handling of sensitive data by e-waste recycling firms. Although certification is a long and arduous process that also involves a significant monetary investment, all of the e-waste recycling firms that had achieved accreditation admitted that it had brought

---

and labour protection (Humphrey & Schmitz 2004; Nadvi 2004; Nadvi & Wältring 2004; Quadros 2004; Muradian & Pelupessy 2005; Ponte & Gibbon 2005; Hess & Coe 2006; Nadvi 2008; Guthman 2009; Riisgaard 2009; Henson & Humphrey 2010; Kaplinsky 2010; Riisgaard & Hammer 2011; Lee et al. 2012; Tran et al. 2013). In this section, I argue that third party standards are employed by recycling firms as a strategy to improve their competitiveness by expanding their clientele and thus have greater opportunities at value creation, enhancement and capture.

about significant positive improvements to their business. For example, FRERPng #1, FRERKul #2, FRERSgp #2 and FRERSgp #3 indicated that the initial cost of attaining each certification was in the range of between USD 5,000 to USD 15,000, depending on the annual turnover of the firm, the total number of employees, and the nature of the operations. In addition to this initial cost, there is an annual cost required to maintain each certification that ranges from between USD 3,500 to USD 6,500. At one level, the certification allowed for these e-waste recycling firms to be considered as reliable operators by financial and legal institutions, such as banks and law firms, that required their computers to be recycled in a manner which ensured that sensitive data would be destroyed through the crushing of the drives, rather than being recycled; and also by government offices that had similar concerns over data security. According to FRERSgp #5, whose firm has ISO 14001 and ISO 9001 accreditation and counts several government offices and banks as their customers, certification opened the firm to opportunities that were previously unavailable because these clients only dealt with firms that had these certificates and who would also issue assurances of the complete destruction of sensitive data through the Certificate of Secure Destruction:

> Although certification cost us quite a bit, and took a long time, when it was over… we were all very glad because it meant we had more business opportunities. Many of the banks, hospitals, government ministries and statutory boards bind us with contracts… they require us to dispose of their e-waste by crushing the hard drives. They don't even want us to do any data sanitising. They want the chips and all the parts destroyed and crushed… accreditation is important. Our profits went up by about thirty percent once we managed to get our certificates.
>
> (Interview with FRERSgp #5, Singapore)

In all interviews with e-waste recycling firms that had accreditation, the firms' customers were cited as having highlighted the security and safeguarding of confidential information as key concerns. In addition, acquiring certification was seen by e-waste recycling firms as a 'coming of age' or 'rite of passage' that saw them becoming significant players in the e-waste recycling industry. In addition, several of their customers wanted to be assured of secure data protection, and that the e-waste that was sent to them was destroyed in a manner that would prevent the recovery of data that might still be stored in it. Hence, e-waste recycling firms provided a "Certificate of Secure Destruction" or something similar to assure their customers that their sensitive data was not going to be retrieved in any way or form (see also Reddy 2013).

In essence, certification is seen by e-waste recycling firms as a significant step towards increasing the opportunities to create and capture value in the e-waste recycling network, but does involve a significant financial investment, and opens up the firm to external scrutiny – a practise that is not always appreciated due to the grey practices that are prevalent in the e-waste recycling industry, which may include practices of corruption with government officials and commercial firms, undocumented sourcing of e-waste, and illegal disposal of waste materials (FRERKul #1; FRERPng #4, #6; FRERSgp #2, #5; PRERSgp #2; PRERKul #5; PRERPng #3, #5). For example, FRERSgp #5 argued that "not everyone is keen to have certification since your books, your practices, your every breath goes under the microscope." The need for transparency has been a huge deterrent for firms in both Malaysia and Singapore who engage in international buying and selling practices that are undocumented and illegal (see also section 4.3).

Another aspect of international certification that has become increasingly important to the e-waste recycling network has emerged from a concern for the environment. These included strategies to address uncertainties over the growing scarcity of resources; the pollution of the environment due to practices related to mining activities and the proper disposal of e-waste. These were common themes that emerged in interviews with various own brand manufacturers and contract product manufacturers both in Malaysia and Singapore (OBMPng #1, #2; OBMSgp #1, #2; CtMfPng #2; CtMfSgp #1, #3). "Green Certification" – which ranges from certificates that attest to the use of renewable sources of energy in the production process, to the manufacture of products using recycled materials, and the design of products which are more energy efficient – is a means to gain competitive advantage by manufacturers who are keen on differentiating their products while satisfying the demands of a more environmentally-conscious clientele. For example, OBMSgp #2 suggested that his firm was committed towards using recycled metals as a source for inputs into their products due to their commitment to environmentally sustainable production:

> We aim to be an environmentally-friendly company, and have thus undertaken steps to meet these goals. We try our best to source from suppliers that share our ethos, and are also actively involved in utilising recycled materials in their production. Although this has cost us financially,… in terms of getting green certification and ensuring that recycled material inputs do not compromise on the quality of the product,… we are still determined to keep green technologies at the core of our production systems.
>
> (Interview with OBMSgp #2, Singapore)

Indeed OBMSgp #2's incorporation of environmentally-sustainable manufacturing practices is similarly echoed by OBMPng #1 and #2, and CtMfSgp #3. This shift towards utilising recycled metals and materials in production is perhaps a strategy adopted by individual firms, rather than an industry-wide movement, that is aimed at product differentiation and the accumulation of brand rents, so as to increase market capture and influence (Gereffi 1999; Pike 2009; Pike 2013).

In this section, I have analysed the role of international standards certification in increasing the opportunities for value creation and capture in the e-waste recycling network in Malaysia and Singapore. E-waste recycling firms perceive certification and accreditation by international bodies as an influential path towards accessing a wider customer base. However, certification is a double-edged sword, as it opens a firm to scrutiny, which may be detrimental if they have been/are engaging in illegal activities. As such, international standards certification is seen as an avenue for increasing value creation and value capture by certain segments of capital in the value chain. In the next section, I discuss the strategy of hoarding and bottlenecks as practised by e-waste wholesalers in the e-waste recycling network, and how this aids them in capturing more value.

### 5.5.3 Creating Bottlenecks

The continuous flow of capital, in its different forms, is vital to the reproduction of the e-waste circuit of capital (see Figure 5.1). However, action by various actors can cause disruptions to this flow, and result in significant downstream effects (Marx 1956, see also Henderson 2013). In this case, by reducing the supply of e-

waste, e-waste wholesalers aimed to raise the price of paid by recycling firms, and thus enable wholesalers to capture more value.

One such incident of a bottleneck in the e-circuit of capital occurred in 2011. Both informal and formal e-waste wholesalers in Penang collectively decided to cause a significant reduction to the volume of primary processed e-waste sold to e-waste recycling firms in Penang. Some wholesalers (IEWPng #1, #2; FEWPng #2, #3, #4, #5) recounted that this collective act of hoarding was in response to the low prices that e-waste recycling firms were paying for the primary processed e-waste. As a result of their dissatisfaction with relatively low prices, which were coupled with very high global market prices for copper in late 2010 to mid 2011 (Carpenter 2010; Colombo 2013; Walker 2013), six out of eight e-waste wholesalers interviewed in Penang reported that they collectively decided to limit the amount of copper-rich e-waste sold (FEWPng #1, #3, #4; IEWPng #1, #2, #3). This collective action – that emerged from a group discussion among disgruntled e-waste wholesalers and disseminated through their personal contacts with other e-waste wholesalers – resulted in e-waste recycling firms relenting, and raising the prices paid to a level in tandem with the steep increases in price seen on the London Metal Exchange (FEWPng #1, FRERPng #2, PRERPng #4). Undoubtedly, the action of the e-waste wholesalers was facilitated by the increased cost incurred by e-waste recycling firms from purchasing copper-rich e-waste from locations further afield in Malaysia and even in the region. To cope with the fluctuations in prices for e-waste, wholesalers in Malaysia in general were able to turn to both legal and illegal means of accessing monetary loans for them to succeed in this collective action (see section 6.2.2). Formal wholesalers in Malaysia are able to

access monetary loans from financial institutions because of their legal status. As registered companies, formal wholesalers are able to get loans from banks which is an option unavailable to informal wholesalers. Nevertheless, informal wholesalers in Malaysia reported that they managed to secure loans from illegal moneylenders by using their shop premises as collateral (IEWKul #1; IEWPng #1, #3). Hence, e-waste wholesalers in Penang leverage on their relatively larger warehouses or shop-spaces (compared with their Singaporean counterparts) to hoard e-waste, and are thus better able to use this strategy as a means of both accumulating larger volumes of e-waste to negotiate a better price from e-waste recycling firms, and also to hoard e-waste in an effort to create a general shortage in specific kinds of e-waste and induce a reduced supply.

Though bottlenecks are rare in the regional e-waste recycling network in Malaysia and Singapore, and are often short-lived because the continuous and smooth flow of capital is essential to the value creation, enhancement and capture opportunities of all actors involved in this production network, the strategy has been employed to good effect by wholesalers, as demonstrated by the incident in Penang. Nonetheless, this strategy is one that was shared with nostalgia by the wholesalers in Penang, who discussed it with the aim of demonstrating that they are not always at the mercy of recycling firms. In the next section, I discuss the strategy employed by wholesalers and recycling firms in externalising the risks involved with collecting, dismantling, disassembling and sorting e-waste to *karung guni*, and how this increases value capture for wholesalers and recycling firms.

### 5.5.4 Externalising Risk

To reduce the amount of risk that they take on themselves, e-waste wholesalers and recycling firms externalise this risks involved in the collection, dismantling, disassembly and sorting of e-waste to *karung guni* (Figure 5.1, Stages 1 and 3) by relying heavily on *karung guni* for the collection of e-waste. In this way, wholesalers and recycling firms distance themselves from the risks related to fluctuating volumes of e-waste available for collection. In this subsection I argue that *karung guni* are integral to the economic success of e-waste wholesalers and recycling firms (i.e. downstream actors) by internalising the risks of collection and primary processing of e-waste.

*Karung guni* are articulated with the regional e-waste recycling production network as a source of means of production for recycling firms who purchase primary processed e-waste through wholesalers. Although several e-waste recycling firm representatives suggested that they were in a mutually beneficial or symbiotic relationship with *karung guni*, it was evident that they were capturing value from *karung guni*, as was demonstrated through their pressures on e-waste wholesalers to sell the material at cheaper prices, which would directly impact the amount of money paid to *karung guni* for the primary processed e-waste (FRERKul #1, #2; FRERPng #1, #3, #4, #6; FRERSgp #2, #3, #6, #8; PRERKul #1, #3, #4, #5; PRERPng #1, #2; PRERSgp #1, #4, #5). FRERSgp #2 stated that his firm is heavily dependent on *karung guni* for their inputs:

> *Karung guni* are essential to our operations. Their collection of e-waste covers a network that would cost us a huge capital outlay to mimic.
>
> (Interview with FRERSgp #2, Singapore)

Analysing FRERSgp #2's response, it can be observed that the primary motivation is driven by cost-minimisation, because the established collection geographies of *karung guni* would be financially unwise to copy. Be that as it may, this reliance does not translate into FRERSgp #2's firm paying more to e-waste wholesalers for the primary processed e-waste, or to deal directly with *karung guni*. In fact, FRERSgp #2 shared that his firm regularly placed e-waste wholesalers in price competition with each other to supply primary processed e-waste, therefore driving down prices even further. Indeed, in section 5.3, I argued that the e-waste sold by *karung guni* to e-waste wholesalers forms the core business of a significant number of e-waste wholesalers. In addition, it is not only e-waste wholesalers who are dependent on *karung guni* for their inputs. E-waste recycling firms are similarly reliant on *karung guni* and prefer to buy directly from *karung guni* rather than going through wholesalers. This reliance on *karung guni* for e-waste is demonstrated in Malaysia, where FRERPng #4, director of an e-waste recycling firm in Penang, Malaysia, reiterated his firm's intimate relationship with *karung guni*:

> We are very reliant on *karung guni* for our inputs. They ensure that we have a steady supply of e-waste and also their dismantling and sorting increases our efficiency in the recovery of recycled metals.
>
> (Interview with FRERPng #4, Penang, Malaysia)

In spite of the declared recognition of dependence on *karung guni* by all of the e-waste recycling firms interviewed, none of them had sought to incorporate or employ *karung guni*. Nonetheless, some recycling firms in Malaysia bypass e-waste wholesalers and go into direct business with *karung guni* – a situation that occurs among *karung guni* in Malaysia, but not in Singapore. The appropriation of suplus value from *karung guni* by e-waste recycling firms was often facilitated by applying pressure on e-waste wholesalers to drive their prices down, or to cite 'global price markets that were beyond their control' as reasons to demand lower prices. As such, although directors of e-waste recycling firms such as FRERSgp #1, stated that his firm was reliant on *karung guni*, they have been in no way motivated to improve the livelihood or revenues of *karung guni*, and instead have been active in pauperising them:

> *Karung guni* are very important to us,… they collect, they dismantle, they sort. We know that. The quality is very good,… but they are not our employees… we do not owe them a living… I let them compete against each other to sell at the lowest price, even if it means that they lose money or earn less… how they manage to live is not my concern. I cannot be worrying about that. I am a businessman, not a charity.
>
> (Interview with FRERSgp#1, Singapore)

When probed further on why the e-waste recycling firms did not seek to employ *karung guni*, and to integrate the collection, disassembly, dismantling and sorting processes into their operations, they candidly stated that it is not in their interest, as this would increase their operating costs, and result in added financial commitments by the firm (FRERKul #2, #3; FRERPng #4; FRERSgp #1, #3, #5, #7; PRERKul #1; PRERSgp #2). FRERSgp #7, chairperson of an e-waste recycling firm in Singapore, stated it plainly:

> … If there is someone out there who can do the job for us without us needing to incur costs, why should we look for trouble? *Karung guni* have already been doing this for so long… We don't need to increase our overheads by including them in our employment…. The costs of employee benefits and CPF contributions… In the end, all the e-waste still comes to us for processing.
>
> (Interview with FRERSgp #7, Singapore)

Indeed, one of the oft-cited reasons for dependence on *karung guni* by e-waste recycling firms was the sorting of primary processed e-waste by hand (see also section 5.3.2). This form of sorting is superior to that of crushing dismantling e-waste and then sorting using existing technology (Robinson 2009; Hieronymi et al. 2012; Pant et al. 2012). FRERSgp #4 explained that his firm had explored various types of machinery, yet still found the primary processed e-waste from *karung guni* to be superior:

> It is near impossible to replicate what *karung guni* do... hand dismantling and manual sorting is very time consuming and labour intensive… No machines are able to do it the same way human hands do it… we have tried many machines… even when compared with the best separating technology available, from a cost perspective, manual dismantling and sorting wins every time.
>
> (Interview with FRERSgp #4, Singapore)

Amongst the full recovery e-waste recycling firms – six out of eight in Singapore, and eight out of nine in Malaysia – shared that primary processed e-waste from *karung guni* was of a very high quality and resulted in greater profits compared to e-waste that was crushed to pellets and then separated. FRERPng #1 argued that the sorting of e-waste by hand allowed for a recovery yield of 85 to 90%, while presently available technology only yielded at best 65% metal recovery from e-

waste.[11] In spite of this dependence on *karung guni* for 'superior quality' sorted e-waste, there was little motivation to employ more workers to hand-sort e-waste, or even to employ *karung guni* directly.

However, the likelihood that an increase in manpower would impact the competitiveness of e-waste recycling firms was put into question when I interviewed six components manufacturers in Malaysia and Singapore. In spite of the protestations by e-waste recycling firms that they are being squeezed by their customers who demand lower prices for recycled precious metals, I found that the recovered precious metals from e-waste recycling firms were in high demand, and as several components manufacturers increase their purchase of recycled precious metals in response to global scarcity and volatile market prices for raw precious metals, one contingent conclusion from this would be that the profits for e-waste recycling firms will be set to increase. CtMfSgp #3, director of a microchip production firm in Singapore, disclosed that his firm was already actively increasing its dependence on recycled precious metals as a strategy to overcome global scarcity in precious metals, and they tolerate a price premium as long as they can be assured of a reliable supply:

> … having a reliable source of recycled metals is important in meeting our commitment to more environmentally friendly production. We presently have inputs of about 30% from recycled sources, and these are often purchased from e-waste recycling firms who can meet our needs,… our technical specifications… we are willing to accept a premium of about 5 – 8% to acquire recycled e-waste in our production.

[11] In a similar finding, Hagelüken & Meskers (2012) argued that manual sorting of e-waste by hand resulted in far higher yields of recovered precious metals as compared to mechanical sorting methods.

(Interview with CtMfSgp #3, Singapore)

CtMfSgp #3's argument that his firm saw recycled metals as both a reliable source and also a hallmark of his firm's commitment to environmentally friendly production was similarly echoed by CtMfPng #2 and #3, who both suggested that they valued green accreditation in their production processes (see also 5.5.2).

In this section, I have examined the importance of *karung guni* to wholesalers and recycling firms, and demonstrated that these actors have externalised the risks involved with the collection and primary processing of e-waste to *karung guni*, as a strategy of increasing their own value capture. Importantly, this section highlights the constitutive and pivotal role of *karung guni* to the continued development and structure of the regional e-waste recycling network in Malaysia and Singapore, and underscores the importance of the informal sector in production networks, which will be discussed further in Chapter 6.

## 5.6 Conclusion

This chapter began by adapting Marx's (1956) circuit of capital to enable an understanding of the flow of value rather than just the movement of the commodity (e-waste) within the regional e-waste recycling network in Malaysia and Singapore (Figure 5.1). Section 5.1 presented the e-waste circuit of capital as the basis for this chapter, and argued that labour and the labour process are integral to value creation in the regional e-waste recycling network in Malaysia and Singapore. In section 5.2, I argued that waste (although it has been discarded) embodies value. I introduced 'latent use value' as a means of understanding the

value that is within waste. In addition, I argued that the labour process is crucial to the creation of value from/in waste. In this sense, e-waste is re-valued through the concrete labour applied to its collection, stripping and consolidation, and like other commodities traded in the market embodies use value, exchange value and surplus value. Importantly, I demonstrated that e-waste is not devoid of value, but rather embodies value when it is re-introduced into production as means of production (raw material). This conceptualization of the inherent value in e-waste – as being valued and valuable – formed the foundations for the following sections. In section 5.3, I examined the functions of the informal sector, and highlighted the integral role of *karung guni* in the collection and primary processing of e-waste. This was followed by an investigation into the bulk collection and further sorting of e-waste by informal wholesalers, where I analysed how these informal wholesalers are articulated with this production network, and act as intermediaries between *karung guni* and recycling firms. Section 5.4 analysed the role of non-contractual relations in facilitating opportunities to create and capture more value in the e-waste circuit of capital. In this section, I argued that the non-contractual nature of trade at various stages in this segment of the regional e-waste recycling network creates uncertainty and unreliability in these transactions. In response to this, several actors have sought to build social relations of mutual dependence and engaged in associations of symbiosis to counter the precariousness that is engendered by the non-contractual nature of exchanges.

In section 5.5, I analysed four strategies of accumulation that are exercised by firms in the regional e-waste recycling network in Malaysia and Singapore to increase opportunities for value creation and capture by various actors in the

network as emerged from the research process. These strategies are closely linked to the e-waste circuit of capital (Figure 5.1), and demonstrate the importance of analysing the flow and distribution of value in GVC/GPN research, as compared to focusing on the movement of the commodities alone. In section 5.5.1, I examined the role of investments in technology, and argued that improvements in technology have increased the yield of recovered precious metals from recycled e-waste by recycling firms. Section 5.5.2 uncovered the strategy of e-waste recycling firms who have successfully attained international certification as means of increasing the value capture by actors in the regional e-waste recycling network. International certification has the effect of both being a competitive advantage that assures commercial firms (clients of e-waste recycling firms) of proper data security procedures and thereby increasing the potential customer base, and protects e-waste recycling firms from legal action should there be a potential leak of commercially sensitive information in the course of the destruction of e-waste from these commercial firms. Section 5.5.3 highlighted the importance of the strategy of hoarding and argued that hoarding was employed to create temporary shortages in the supply of e-waste, or to disrupt the smooth flow of capital in the e-waste circuit of capital. The intended result of this strategy by e-waste wholesalers has been to attain a higher price for e-waste that they sell onward. In section 5.5.4, I investigated the strategy of risk externalisation by wholesalers and recycling firms. By transferring the risks involved with the collection and primary processing of e-waste to *karung guni*, wholesalers and recycling firms are able to capture more value by capturing value from *karung guni* as disguised wage labour. Nonetheless, this section highlights the pivotal and significant role of *karung guni*

to the structure and development of the regional e-waste recycling network in Malaysia and Singapore.

Although intimately linked, the e-waste recycling network in Malaysia and in Singapore have differences. In this chapter, two key differences were identified. First, with regard to investments in technology, Malaysian recycling firms tended not to capitalise on this strategy as a way of scope of their operations, to include more processes, but instead chose to expand the scale of their operations by buying more machinery to improve the efficiency and productivity of their core operations. In contrast, Singaporean recycling firms placed a premium on investments in new processing technologies to extract higher proportions of precious metals from e-waste. Second, e-waste wholesalers in Malaysia were able to create a bottleneck in the supply of primary processed e-waste as a strategy to negotiate higher prices with recycling firms. The argument can be made that this strategy was successful in Malaysia as wholesalers have larger warehouses as compared to their Singapore-based counterparts, and are thus able to employ this strategy as they have the space to store this e-waste while it is being hoarded. In contrast, in Singapore, where space is at a higher premium, wholesalers have smaller storage facilities and are unable to hoard e-waste as effectively and conveniently as their Malaysian counterparts.

Three similarities between the e-waste recycling network in Malaysia and Singapore are also identified. First, non-contractual arrangements among actors in both networks have resulted in firm and non-firm actors forming relations of mutual confidence and dependence to ensure a reliable supply and demand for e-

waste. In this way, economic actors have relied on social relations of familiarity to overcome the uncertainties that are encumbered by the non-contractual arrangements. Second, e-waste recycling firms in Malaysia and Singapore have both increasingly sought international certifications as a strategy to increase their value creation and capture opportunities, by increasing their clientele base and increasing product differentiation. This strategy has been undertaken by recycling firms in both countries to increase their competitiveness. Third, wholesalers and recycling firms in both countries rely heavily on *karung guni* for the collection and primary processing of e-waste as a strategy of externalising the risks involved with these processes. As will be discussed further in Chapter 6, this strategy results in *karung guni* acting as a form of disguised wage labour for wholesalers and recycling firms, and subjects them to increased levels of exploitation.

This chapter has contributed to GVC/GPN research in three distinct ways. First, I have argued that waste embodies value, and to this end, set out the importance of looking at commodities beyond the point of consumption, by highlighting the processes, practices and politics involved in the revalorisation of waste. Second, through an analysis of the e-waste circuit of capital, this chapter has demonstrated the continued importance of the process of value creation in GVC/GPN analysis, and underscored the importance of analysing the flow of value through the network, rather than just the movement of the commodity through processes and geographies. Third, and relatedly, I have argued that the labour process is crucial to the creation, enhancement and capture of value, and have thus contributed to GVC/GPN research positioning labour as a pivotal category and starting point of analysis.

Taken together, this chapter has highlighted the mechanisms and processes through which value is created and captured within this segment of the regional e-waste recycling network. The critical role of labour and the labour process in global production networks was emphasized in this chapter. In the next chapter, the significant and integral role of *karung guni* is explored through a conceptualization of *karung guni* as petty commodity producers in order to argue that informal labour –in particular *karung guni* – are constitutive of the regional e-waste recycling network in Malaysia and Singapore, and are pivotal to the development and structure of the network. To this end, I analyse the strategies undertaken by *karung guni* to ensure their social reproduction and survival, in particular through their interactions with the formal sector. These articulations with the formal sector by *karung guni* challenge conceptualisations of the formal and informal sectors as distinct and separate spheres of the economy.

# Chapter 6

## Social Reproduction and Survival Strategies of Informal Labour

## 6.0 Introduction

As presented in Chapter 5, *karung guni* are important actors in the e-waste recycling network in Malaysia and Singapore, most notably for their role in value creation through the collection and primary processing of e-waste. In this chapter, the focus is on the role of informal labour in regional e-waste recycling global production networks in Malaysia and Singapore, looking specifically at *karung guni* as petty commodity producers (PCPs). I analyse *karung guni* as informal labour because of two reasons: (1) regardless of their legal status (licensed or unlicensed in the case of *karung guni* in Singapore), *karung guni* do not have the same employment benefits as other workers in the formal economy; and (2) their relations of production are different from that of wage workers who are employed by the firms that they work for. Conceptualising *karung guni* as informal labour is fruitful in providing an avenue to analyse the importance of informal labour to the structure and development of production networks, and also highlights the constitutive role of informal labour in the processes of value creation, enhancement and capture. *Karung guni* are part of a wider system of informality in the regional e-waste recycling production network that also includes informal e-waste wholesalers (see section 5.3.3) and their functions are integral to the functioning and operation of the regional network.[12] I seek to conceptualise the role played by the informal sector, who are labour actors that have been erstwhile

[12] Similarly, other scholars have identified a wider range of economic actors – beyond just itinerant waste buyers – as constitutive of the informal sector in waste production networks (Chi et al. 2011; Oguntoyinbo 2012; Katusiimeh et al. 2013).

under-researched in favour of workers in the formal sector – where the empirical focus of most work on labour geographies in GVC/GPN studies has been on workers in farm (Barrientos & Kritzinger 2003; Barrientos et al. 2003; Selwyn 2009a; Selwyn 2009b; Selwyn 2010b) and factory settings (Coe et al. 2008a; Cumbers et al. 2008; Quan 2008; Raj-Reichert 2011; Lund-Thomsen et al. 2012; Lund-Thomsen 2013; Raj-Reichert 2013; Lund-Thomsen & Coe 2013; Xue & Chan 2013).

I argue that the informal sector is always already articulated with the regional e-waste recycling network. As such, the informal sector should be considered more fully for its significance in and contribution to the structuring of global production. To this end, I analyse *karung guni* through the conceptual lens of petty commodity production. This lens offers a means to conceptualise *karung guni* as the embodiment of both capital and labour, through the ability to reconcile the apparently contradictory functions of labour power and capital (i.e. owners of the means of production). This ownership of the means of production, coupled with their active role in the labour process, position *karung guni* in a category that is distinct from capitalists and wageworkers. I argue that the informal sector is critical to the regional e-waste recycling network in Malaysia and Singapore, and *karung guni* – conceptualised as petty commodity producers – constitute key actors that need to be analysed in their own right, paying attention to their social reproduction and survival strategies and their articulations with the rest of the actors in the production network. The conception of *karung guni* as embodying both capital and labour challenges conceptions of labour in GVC/GPN studies that

conceptualise labour as a category distinct from capital in the wage labour – capitalist relation.

To this end, this chapter seeks to contribute to GVC/GPN research in three ways: (1) by highlighting the importance of informal labour as constitutive actors in production networks, I extend the conceptualisations of the category of 'labour' in GVC/GPN research; (2) through a conceptualisation of *karung guni* as petty commodity producers, this chapter challenges present conceptualisations of capital-labour relations in GVC/GPN research by examining the economic practices of *karung guni* who are the embodiment both capital and labour through their ownership of both the means of production and their own labour power; and (3) the lives of *karung guni* are intimately intertwined and articulated with the formal sector in a myriad of multifarious ways. In this chapter I analyse the strategies that they employ to ensure social reproduction and survival (Smith & Stenning 2006; Kelly 2009; Kelly 2011; Kelly 2013). Nonetheless, the strategies that are discussed here are not exhaustive of those that are employed by *karung guni*, rather they are the most prominent as emerged through the research process. In addition, they reflect the social reproduction and survival strategies of economic marginalised groups as discussed by other scholars (Portes & Sassen-Koob 1987; Daniels 2004; Nas & Jaffe 2004; Alter Chen 2006; Meagher 2006; Smith & Stenning 2006; Stenning et al. 2010; Cling et al. 2011; Bunnell & Harris 2012; Reddy 2013).

This chapter proceeds as follows. In the next section, I briefly discuss theorisations of the informal sector, and the main debates in that literature. In section 6.2, I conceptualise *karung guni* as petty commodity producers. This conceptualisation

enhances present understandings of labour in global production networks, and highlights the importance of considering labour actors beyond those that are protected by labour legislation or that work in factories or in situ. In section 6.2.1, I discuss how *karung guni*, as owners of both the means of production and labour power, are more akin to disguised wage labour in their articulations with the regional e-waste recycling network in Malaysia and Singapore. In contrast to petty capitalists who are motivated by the desire for capital accumulation, in section 6.2.2, I argue that *karung guni* are motivated by the need for survival and to provide the sufficient means for social reproduction. These two characteristics of *karung guni* form the basis for an appreciation of the discussion in section 6.3. The focus of section 6.3 is on the diverse practices and strategies of *karung guni* in an effort to ensure survival and social reproduction in this production network in Malaysia and Singapore. These strategies may be best understood in relation to debates on social reproduction and survival strategies (Kelly 1999; Smith & Stenning 2006; Kelly 2013), and in section 6.3 I aim to contribute to these debates by considering these *karung guni* strategies. The chapter concludes by highlighting the importance of the informal sector and their strategies towards the development and structure of the e-waste recycling network in Malaysia and Singapore. In essence, this chapter contributes to GVC/GPN research by demonstrating that: (1) understood through the lens of petty commodity production, *karung guni* have ownership of both the means of production and of their own labour power which they combine to enact strategies to ensure their social reproduction and survival; and (2) the social reproduction and survival strategies of *karung guni* are integral to the structure and development of this production network.

## 6.1 Theorising the Informal Sector

The dichotomy of the economy into distinct formal and informal sectors/economies (Hart 1973) has been suggested by several scholars as unproductive in understanding the inter-meshed nature of complex economic geographies (Moser 1978; Williams & Windebank 1998; Gerxhani 2004; Williams 2010). For example, Hibou (1999, p.80) suggests that "the division into formal and informal spheres is thus not a useful distinction… since illegal practices are also performed in the formal sector, while so-called informal economic networks operate with well-established hierarchies and are fully integrated into social life". Conceptualising the economy according to a formal-informal binary thus fails to pay heed to the hybrid nature of many activities in economic geographies.[13] In addition, the concept of separate formal and informal sectors obfuscates the diversity of economic practices and differentiated articulated production relations that are present within the economic systems of the contemporary economy (Breman1976a; Breman 1976b; Breman 1976c; Santos 1979; Meagher 2010). In spite of this shortcoming, the formal-informal binary has managed to survive the many critiques that have been levelled against it (Hart 2005), including the critique that highlights a disproportionate amount of power vested in the state in deciding this binary (Mosley 1978; Lyons & Snoxell 2005; Us 2006; Chakrabarti 2013). Moving away from a conceptualisation that sees the informal sector

[13] Scholars have argued that activities in what may be considered the formal sector may also have decidedly informal practices, such as tax evasion, or the payment of wages to staff in pay envelopes to avoid social security contributions (Mars & Nicod 1981; Breman 1976a; Daniels 2004; Perry et al. 2007b; Castel & To 2012).

juxtaposed against the formal sector (with the informal as 'subordinate' to the formal)[14], towards an understanding of the economy as constituted by activities that are located on a formal-informal continuum removes the value judgements placed on the productivity, efficiency and significance of each sector (Bromley & Gerry 1979; Gerry & Birkbeck 1981; Roy 2005; Lombard & Huxley 2011). This reconceptualisation allows for recognition of the pluralisms and complexities that comprise contemporary economic geographies (Moser 1978; Gibson-Graham 2008). Understanding economic geographies as complex, dynamic and inter-woven at various scales highlights the nature of economies and economic geographies as being created by and for the economic actors who make their living through them – both directly and indirectly – and indeed, who constitute and are shaped by the various processes and mechanisms in the contemporary economy (Lee et al. 2004).

The informal sector is often defined as being beyond the regulation of the state, or as selectively tolerated by the state in an effort to achieve other economic and political objectives (Hart 1973; Moser 1978; Santos 1979; Tokman 1992; Günther & Launov 2012). The state plays a key role in circumscribing the spaces and circumstances under which the informal sector is able to participate in economic and social life through laws and regulations that simultaneously have the potential to marginalise the informal sector, and to provide opportunities for economic survival. Indeed, the contingent categorisation of activities, groups of people and

[14] Several scholars have challenged the view that the informal sector is 'subordinated' to the formal sector, including Cheng & Gereffi (1994); Williams & Windebank (1998); Williams & Windebank (2002); Alter Chen (2006); Tanaka (2009); Williams (2009); McFarlane & Waibel (2012).

geographical areas as formal/informal is dictated by the political agendas of the state in creating order in the economic landscape (Santos 1979; de Soto 1989; Ho et al. 1997; Lee 2000; Kurfurst 2012). In this way, the co-optation of the informal into the formal – the process of formalisation – has been adopted by various developing states as a 'benign' method of improving the welfare and lot of the urban poor, with varying levels of success (Assaad 1996; Sepulveda & Syrett 2007; Velis et al. 2012).[15] Indeed, one of the main reasons for the limited success of efforts at formalisation has been a failure to recognise the diversity of informal activities that are captured in the umbrella term the informal sector. The social relations of production that exist within the informal sector are diverse, and include petty commodity production (which is marked by the ownership of both means of production and labour power) and the sale of labour power in the form of precarious/informal employment. These different social and technical relations of production within the informal sector entail a myriad of always already existing articulations with the circuit of capital, and specifically, the regional e-waste recycling production network. I argue that the relationship between the formal and informal is not a binary, but rather exists on a formal-informal continuum. It is through an acknowledgement of the diversity of economic practices that a clearer understanding of the heterogeneous mosaic of economic activities that constitute contemporary economic geographies can be obtained.

[15] Several scholars have challenged 'formalisation' thesis, and argued that the co-optation of the informal sector into the formal has been unsuccessful and ineffective due to bureaucratic excesses, and the lack of capacity at handling the process of formalisation (de Soto 1989; Simon & Birch 1992; Bangasser 2000; ILO 2002a, Guha-Khasnobis et al. 2006; Williams & Round 2007; Faundez 2009; Cling et al. 2012).

## 6.2 *Karung Guni* Through the Lens of Petty Commodity Production

In this section, I seek to analyse the economic role of *karung guni* through the lens of petty commodity production (PCP) frameworks as they emerged in debates in the 1970s and 1980s (LeBrun & Gerry 1975; Gerry 1978; Moser 1978; Williams & Tumusiime-Mutebile 1978; Bernstein 1986; Scott 1986; Smith 1986). The concept of petty commodity producer is particularly informative to this analysis of *karung guni* through its theoretical and conceptual understanding of reconciliation of the contradictory functions of labour and capital under the capitalist mode of production. The PCP concept challenges the conceptions of capital and labour as separate entities in GVC/GPN research, and in this way extends the theorisation of actors in production networks. In addition, the PCP concept contributes to understanding *karung guni* as actors that are always already articulated with the capitalist mode of production in varied, rather than singular ways. Importantly, the literature argues that petty commodity production is not a remnant of pre-capitalist production – which will disappear as economies develop or as modes of production 'articulate' (Banaji 2010) – but rather, is a form of exploitation that will persist alongside other forms of exploitation under capitalism (Gerry & Birkbeck 1981; Friedmann 1986; Bernstein 1988; Campling 2013). PCP can thus be seen as co-existing with other relations of production, which collectively constitute the capitalist mode of production. Importantly, PCP must always be located "in much wider relations of production, circulation and consumption" to be understood; hence any attempts at studying PCP must be oriented towards an understanding of its relationship with the dominant mode of production (Harriss-White 2012, p.125).

### 6.2.1 Contradictory Unity of Labour and Capital

Under capitalism, the 'classic' form of exploitation – where capitalists own the means of production, and purchase labour power to create (surplus) value through the labour process (Fine 2012; see also Elson 1979; Kay 1979) – capital and labour are conceptualised as two distinct categories. In the 'classic' form of exploitation, capitalists purchase labour power for a fixed period in the form of wage paid to workers, and exploit this labour by extracting surplus value through the labour process. After the commodities have been sold on the market, capitalists realise this surplus value as increased revenue (profit). However, in PCP labour and capital are embodied in the same individual – in my case, *karung guni*. PCPs are thus differentiated from pure wage labour in Marx's (1990) sense because of their ownership of the means of production (in the case of *karung guni*: e-waste). PCPs are differentiated from pure wage labourers who have no possession of the means of production or the means of subsistence, and sell their labour power to survive (Byres 2012). According to Bernstein (1986, pp.262-263) PCPs are "constituted as a contradictory combination of capital and labour", whereby "the distinctiveness of PCP is given by its particular combination of capital and labour". This combination is where "the owners of the means of production are also directly involved in the process of production" (Middleton 1989, p.142). Consequently, Friedmann (1986) argues that the contradiction can be best analysed at the scale of the individual, whereby the individual owns both the means of production and his/her own labour power. In addition, LeBrun and Gerry (1975, p.26) argue that the petty commodity producer

> himself [*sic*] effects the whole process of transforming his [*sic*] chosen raw materials and is in control of the production-process, deciding when and how he [*sic*] shall work, what tools he [*sic*] shall use and in what manner, and he [*sic*] has no need of others to tell him [*sic*] what should be done.

Friedmann (1986, p.47; emphasis mine) suggests that in categorising PCP, "the unity of property and labour within capitalism refers logically to *individuals*". This consolidation of capital and labour at the scale of the individual is seen in *karung guni*, who are self-employed, purchase their own means of production (i.e. e-waste), control their own labour power, work independently, and are in direct control of the labour process, which they are actively part of (i.e. it is their own labour that is exploited in the labour process to create value). KGPng #4, vocalised this point:

> I am my own boss… I start work when I want to, I stop work when I want to. This feeling of freedom is something that I will not give up willingly.
>
> (Interview with KGPng #4, Penang)

In addition, an entry in my field notes from accompanying KGSgp #6 for 13 hours highlighted the very flexible nature of their work arrangements:

> Begins collection around 10am. Stops at 11.30am for short break. Resumes collection, stops for lunch at 12.30. Goes to fetch children home from school at 1.30pm. Does more collection. Brings wife to see doctor at 4pm. Does not do collection for rest of the day. Goes home, begins disassembly and sorting till around 11pm. Dinner time is flexible.
>
> (Field notes entry #16, Singapore)

Indeed, the flexibility of the work arrangement affords *karung guni* with a significant amount of "freedom" to engage in familial commitments (such as bringing a spouse to the doctor, fetching children from school), but this independence is not without the constant pressing need to ensure sufficient revenue to guarantee survival on a day-to-day basis.

Although they exist within very constrained economic conditions, with subsistence being their primary objective, *karung guni* are more akin to labour than capital, given how they are often a form of disguised wage labour for actors downstream in the regional e-waste recycling production network. In this sense, while it may appear that *karung guni* are independent and are owners of their own labour power, they are in fact not dissimilar to the wage labour that is employed by firms because of their dependence on the firms for their income and survival. Despite their outward appearance of independence and autonomy, *karung guni* may be best understood as 'disguised wage labour' (Rainbird 1991; see also Banaji 1977; Moser 1978; Bromley & Gerry 1979; Kennedy 1981; Harris 1982; Elson 1999), since their economic situation does not permit them to *not* engage in PCP, and their existence as *karung guni* is contingent on the subsequent purchase of their primary processed e-waste by wholesalers and thereafter by e-waste recycling firms. As PCP, *karung guni* in the regional e-waste recycling network in Malaysia and Singapore may be understood as more closely affiliated to labour than capital for four reasons. First, *karung guni* are not driven towards capital accumulation, or the desire to progress towards forms of petty capitalism. Rather, their main economic motivation is to meet daily needs and their continued survival. In this sense, their underlying impetus is to ensure social reproduction. Second, although

they own the means of production, they are not in relations of production that see them purchasing the labour power of others. In this sense, they exploit their own labour power, and are actively involved in the labour process[16]. Third, they occasionally sell their labour power to recycling firms as outsourced labour for the dismantling, disassembly and sorting of e-waste (see section 5.3.2). Fourth, they are disguised wage labour for wholesalers and recycling firms who rely on them heavily for their collection, dismantling, disassembly, and sorting services. Wholesalers and recycling firms are not motivated to do these activities because *karung guni* already perform them, and are perceived by these firms as an effective way of outsourcing these processes and externalising the risks associated with these processes (see section 5.5.4).

*Karung guni* are reliant on the formal economy, in spite of their apparent ownership of the means of production and of their own labour power. In contrast to 'classic' capitalists who are able to manipulate production to their advantage and extract surplus value as such, *karung guni* themselves are exploited in this production network. The exploitative relationship (whereby surplus value is appropriated by wholesalers and other downstream actors through the process of exchange) is illustrated by the PCP's dependence on the formal sector for both its inputs and outputs. KGSgp #13, encapsulated this dilemma most aptly:

> At the end of the day, I know that I am still at the mercy of people who buy from me. In the worst situation, I am stuck between buying from households at a high price, and selling at a low price. But what

[16] In addition, they exploit the labour power of their family members for free (i.e. without paying a wage; see section 6.3.4).

> can I do? I have to make a living somehow, and this gives me the most flexibility and most independence.
>
> (Interview with KGSgp #13, Singapore)

However, in spite of being more akin to labour than capital, *karung guni* face greater challenges in worker organising compared to their counterparts who work in situ, and are less likely to be successful at union organisation due to factors such as their individualistic working patterns, the geographical mobility in their trade, and the spatially dispersed nature of production (see section 4.4; Wills 2002; Savage & Wills 2004; Wills 2008). The prospect of *karung guni* unionisation and the formation of co-operatives (which has happened in a few instances, see section 6.3.3) can significantly reconfigure power relations in the e-waste recycling network in Malaysia and Singapore. *Karung guni* are not alone in their poverty, and often receive assistance from family members (see section 6.3.4), other *karung guni* (through co-operatives, and by co-operating as pairs), and informal e-waste wholesalers to support their trade. Their survival strategies are varied, and not solely dependent on the purchase of their processed materials by e-waste wholesalers and e-waste recycling firms downstream. Their varied strategies – which include moonlighting (see section 6.3.9) and oscillating between states of employment in waged labour and as *karung guni* – are indicative of the dynamic nature of this economic activity. *Karung guni* live in economically precarious states, and are unable to capture more of the value that they create through the labour process because of the asymmetrical bargaining power of *karung guni* on the one hand, and wholesalers and recycling firms on the other.

### 6.2.2 Subsistence

According to LeBrun and Gerry (1975, p.23), PCP engage in economic activities "with the main result of whose productive activity is simply the reproduction of their means of subsistence and their social relations of production". *Karung guni* continue to engage in their trade mainly as a means of subsistence, and do not have the means towards achieving a significant accumulation of capital.[17] Although there have been cases of *karung guni* making it rich and earning quite a comfortable living, such success is not the norm for most in the trade (Teh 1994; Tan 2001; Lum 2002; Leong 2005; Lim 2007). Nonetheless, *karung guni* are motivated by the compulsion to meet their daily needs. Barbara Harriss-White argues that "PCP reproduces and expands but does not accumulate" (2012, p.124); and that "PCP multiplies, but… it does not lead to more advanced forms of accumulation" (Harriss-White 2012, p.144). This does not however mean that there are no dreams of success, or even establishing co-operatives to prosper (UKGSgp #19, #27, #35; KGKul #2, #12, #17; KGPng #8, #19, #20). The possibilites for upgrading and expansion are present (such as becoming wholesalers, or becoming petty capitalists by employing other *karung guni* under them), but *karung guni* are very much constrained by the lack of financial resources and the lack of access to more advanced technology (such as machines to dismantle or crush e-waste) or more vehicles for collection (KGKul #4, #9, #14, #17; KGPng #8, #9, #13, #20; UKGSgp #1, #5, #14, #32, #40).

[17] In section 6.3, I discuss various strategies employed by *karung guni* to enhance their value capture. Nonetheless, the motivation for these strategies remains at its core their need for survival. This increased value capture does not translate towards wealth or capital accumulation. Rather this increased revenue contributes towards their daily needs and a relatively more stable life.

As such, because of the exploitative nature of PCP articulations with the circuit of capital, the accumulation of capital by PCP occurs only very rarely, if ever. As noted, *karung guni* often only have enough to survive, mostly living from hand-to-mouth, with some of them (KGKul #17, #20; KGPng #2; LKGSgp #1, #4; UKGSgp #1, #7, #17) having a small amount of revenue to invest in their *karung guni* activities, but not sufficient amounts to progress towards some form of petty capitalism.

Within the PCP debate, there has been the disagreement over the future of PCP (Davies 1979), with several scholars suggesting that PCP will subsequently be proletarianised (Kennedy 1981; Smith 1989; Amin & van der Linden 1997). It has been argued by some scholars that the informal sector is the economic realm of last resort and those occupying those places aspire towards returning to the formal sector (Portes 1978; Portes et al. 1986; Portes & Sassen-Koob 1987; Barnes 2011; Keck 2012). Instead, *karung guni* indicate that they prefer their status in their job mainly because of the freedom that they enjoy, in spite of the unpredictable income. KGSgp #5, explained his motivations to continue in this trade:

> Although there are times when I don't have enough money for my family, I will not ever go back to working for someone. I am too happy working for myself, and taking breaks and starting as and when I want. My freedom is what I treasure.
>
> (Interview with KGSgp #5, Singapore)

Indeed, 39 out of the 41 *karung guni* interviewed in Malaysia, and 45 out of the 46 interviews in Singapore stated that they would prefer to remain as *karung guni* (see also *The Straits Times* 2001). Rather than subscribing to the economic motivation of maximisation of revenue, *karung guni* thus subscribe to a different logic of value(s) – one which is more than just economic value, and includes their belief in self-employment and independence. In addition, it is the unpredictable revenue that gives hope to *karung guni* of one day becoming successful, as there is no ceiling on their potential. It is in this way that several *karung guni* suggested there is more money to be made (KGKul #1, #19; KGPng #3, #13; LKGSgp #1, #5; UKGSgp 2, #14, #19, #25, #30, #35). Although – theoretically speaking – the amount of revenue a *karung guni* can earn is limitless, they are nonetheless constrained by their individual physical limitations. This can be seen both in the limited physical energy of an individual, and also in the amount of territory a *karung guni* is able to cover over a fixed period of time (see sections 4.4 and 6.3.7). In addition, the market size for the disassembled and sorted e-waste plays an important role in influencing the amount of revenue that a *karung guni* can earn. In spite of these limitations, there still remain great incentives for individual *karung guni* to increase their revenue, as is demonstrated by the very long working hours of the *karung guni* I encountered. From my interviews and field observations with those *karung guni* that I accompanied, many *karung guni* (40 out of 46 in Singapore, and 34 out of 41 in Malaysia) were engaged in work for more than 12 hours a day, including the time they spend at home disassembling and sorting the collected e-waste. While nonetheless spurred by their need to ensure daily survival, *karung guni* see themselves as more fortunate than their waged labour counterparts, who regardless of productivity or efficiency, receive a fixed wage.

The trade-off made by some *karung guni* for more leisure time, or the ability to commit time to familial responsibilities is seen as a fair opportunity cost for the financial security that waged work offers (KGKul #4, #18; KGPng #16; LKGSgp #2; UKGSgp #13, #17, #26).

## 6.3 Social Reproduction and Survival Strategies of *Karung Guni*

In this section, I unpack the nine key strategies through which *karung guni* seek to ensure and improve their social reproduction possibilities and survival in relation to the regional e-waste recycling network in Malaysia and Singapore. These everyday practices of *karung guni* are important to the development and structure of this production network, and are understood as methods employed by *karung guni* to ensure the sustenance and subsistence of them and their families. In this sense, "the singularity of economic life" and its *raison d'etre* are grounded in economic practices "which enables social reproduction and which is 'life-sustaining'" (Stenning et al. 2010, p.77; see also Lee 2006). Mitchell et al. (2003, p.416) argue that social reproduction is "[a]t the most fundamental level… about how we live", and for *karung guni*, the strategies discussed in this section are about how they sustain life through their economic activities. Termed as "the fleshy, messy and indeterminate stuff of everyday life" (Katz 2001, p.711), social reproduction is crucial for *karung guni* in providing them (and their families) the means to live another day. For *karung guni*, the ability to meet tomorrow's basic material needs is ensured through today's survival strategies. The overarching impetus to engage in the collection and primary processing of e-waste by *karung*

*guni* is found in their need to reproduce "the material conditions of daily existence that enable production to occur", and are "a complex set of knowledges and practices that, while bound up with capitalist production, also reflect… the times, places, and people within which and by whom they are enacted" (Marston 2003, p.176).[18] In this sense, *karung guni* strategies to ensure social reproduction and survival may be best understood as a continuous process: the need to sustain life motivates their everyday economic practices which then provides the means to sustain life for another day. The nine strategies analysed in this section emerged out of the research process, and are reflective of the methods employed by *karung guni* as petty commodity producers to ensure their sustenance, subsistence and survival. Importantly, the focus of this section is on how these *karung guni* strategies are articulated with the regional e-waste recycling network in Malaysia and Singapore, and how they are co-constitutive of the development and structure of this network.

In the first two subsections, I analyse the strategies employed by *karung guni* with regard to their relations with the state and government institutions. The focus of section 6.3.1 is the state as a regulator of their activities (as discussed in section 4.3.2, but they are not always successful in their regulation of *karung guni*). In section 6.3.2, I draw attention to state provisions to *karung guni* and their families in terms of social services and subsidies. Taken together, sections 6.3.1 and 6.3.2 highlight that the government and the bureaucracy are not merely enforcers of

[18] Social reproduction and survival strategies are an important aspect of everyday economic life and practices, and their articulations have significant impacts on the structure of labour markets (Mingione 1983; Smith 1989; Peck 1996; Gilbert 1998; Smith 2000; Smith 2002a; Smith 2002b; Helms & Cumbers 2006).

laws and regulations (Cross 1998), but can also be important in passively supporting *karung guni* in their survival strategies, and indirectly subsidising capital through their provisions to *karung guni*. In section 6.3.3, I analyse the relations of *karung guni* with financial institutions, paying close attention to how *karung guni* formulate strategies to increase their access to financial resources for daily survival, and to better their future financial security. In section 6.3.4, I interrogate the ways in which *karung guni* as individuals rely on kinship and family relations as strategies to improve their social reproduction and survival opportunities. *Karung guni* strategies to increase productivity through the adoption of technology are the focus of section 6.3.5, looking in particular at their strategy of acquiring lorries to increase their value creation opportunities by potentially increasing the volume of e-waste gathered during their daily rounds of collection. In section 6.3.6, I examine the subversive practices of *karung guni*, and shed light on their strategies to increase value capture by using fillers, and practices of tax evasion. Temporary territorial capture, which is a strategy of *karung guni* in Singapore to increase value creation opportunities, and the building of preferential relationships, is the focus of section 6.3.7. In section 6.3.8 I examine the (unintentional) strategy of *karung guni* in Singapore, who caused an increase in the price of e-waste through their hoarding activities. Finally, in section 6.3.9, I investigate the importance of rental spaces to the survival strategies of *karung guni*, and also highlight their practices of moonlighting.

In sum, this section interrogates the strategies and methods that contribute towards ensuring social reproduction and survival by *karung guni* in e-waste recycling networks. In so doing, I unpack the articulations of *karung guni* in

relation to other actors in the network, and highlight the importance of conceptualising *karung guni* as petty commodity producers whose primary motivation is that of meeting daily needs and ensuring long term survival. Fundamental to an understanding of the strategies employed by *karung guni* is their need to ensure social reproduction. Indeed, their continued existence and survival is critical – even if they may not realise this – to the rest of the actors in the e-waste recycling production network. As discussed in section 5.3, *karung guni* are essential to the process of value creation through their collection, dismantling and sorting of e-waste. In spite of the exploitative nature of the relations with firms in this production network who engage with *karung guni* as 'disguised wage labour', they are also motivated to ensure the continued existence of the *karung guni* trade due to their heavy reliance on *karung guni* for their factor inputs.

### 6.3.1 The State as 'Regulator'

For *karung guni*, the first interaction with the state is through its role as an enforcer of laws and regulations (as discussed in section 4.3.2). In this instance, *karung guni* primarily see the law and its efforts at licensing *karung guni* as additional costs that eat away at their revenue. From *karung guni* interviewed in Singapore, it was found that only 6 out of 46 are licensed, or approximately 15%, which is a result that was confirmed by GvtSgp #6 who estimated the licensing system encompasses "around 15% to 20% of all *karung guni* in Singapore", with the rest operating without official recognition by the state. UKGSgp #31, a *karung guni* in Singapore with almost twenty years experience, and who specialised in e-

waste around ten years ago, suggested that licensing does not bring much benefit, and instead brings added responsibility:

> Whether you have a license or not really makes no difference. I have been *karung guni* for more than twenty years. I have not even been asked once by the police to show a license. Why pay for the license if it does not ever get checked, and if those without license are not arrested?
>
> (Interview with UKGSgp #31, Singapore)

UKGSgp #31's experience with law enforcement does not however show a failure on the part of the government to regulate the industry or its inability to exercise control over the industry, but rather, points to what de Soto (1989) identifies as the acceptance of the informal sector, and zones of negotiation granted by the government in its ability to determine the legal landscape. Nonetheless, the system of licensing *karung guni* in Singapore places financial pressures on *karung guni*, and also increases their responsibilities in terms of being transparent about their exchanges. As mentioned in section 4.3.2 (see also section 6.3.6), *karung guni* in Singapore are required by law to receive payment for their primary processed e-waste through cheques rather than cash, which can cause inconvenience and slowdowns to cash flow for *karung guni* who may not always enjoy formal financial services, and who also require working capital (i.e. cash in hand) as part of their survival strategies and to be able to purchase e-waste from households and small offices.[19] UKGSgp #8 shared the problems that he would encounter as a result of signing up for a license:

[19] Henry (1981, p.15) similarly argued that "tax is simplest to evade if the the activity is unregistered, and insofar as all transactions that go through a written invoice-cheque-receipt system can be monitored by the authorities, black economic activity is best transacted in cash".

> The license puts more financial pressure on me. The license is not cheap, around SGD 250 (≈ USD 199). And also, once I have the license, police can fine me for not getting paid through cheques. I prefer cash. My friend, who is not licensed, got caught for receiving payment in cash, and was only given a very light fine. If he had a license, then no way to escape,… will surely be fined the maximum.
>
> (Interview with UKGSgp #8, Singapore)

UKGSgp #8 was referring to the legislation governing second-hand dealers in Singapore (see section 4.3.2). Although his friend was in clear violation of the law by receiving payments in cash, he was let off with a minimal fine as this was his first brush with the law. In spite of the possibility of being fined for operating without a license, UKGSgp #8's friend did not have the charge of operating without a license brought against him (he was instead charged under the *Miscellaneous Offences (Public Order and Nuisance) Act, Chapter 184*). This stands as an example of the government's relatively passive attitude towards the regulation of *karung guni*. Whilst it may seem that the system of licensing appears to be constraining the activities of *karung guni*, the rule of law does not always mean that *karung guni* draw the short straw. 25 out of 46 Singaporean *karung guni* interviewed informed me of their experiences in engaging the police for help when there were scuffles between *karung guni* and also when foreign workers – who are in Singapore working in the construction industry – have attempted to go around housing estates to collect recyclable materials. LKGSgp #2, a *karung guni* for almost fifteen years in Singapore, told me that he has called upon the police several times, especially since he tends to collect e-waste from Little India in central Singapore, where many foreign workers gather on weekends:

> I have called the police a few times when I saw foreign workers collecting from households. They are not allowed to! They are competing with me for my livelihood. So I called the police, and the foreign workers were arrested for violating their work permit.
>
> (Interview with LKGSgp #2, Singapore)

In this way, the relationship of the police with *karung guni* is not antagonistic, but rather, *karung guni*, especially those with licenses, draw on law enforcement officers to aid them in defending their 'turf' and their livelihoods. In the above-mentioned instance where the police arrested the foreign workers, there was a distinct sense of 'us' (*karung guni*) versus 'them' (foreign workers), which sometimes bordered on xenophobia. Male foreign workers in Singapore – mostly from Bangladesh, India, Myanmar and China – work in the building and construction industries in Singapore and live in dormitories, and are given a day off once a week.

In Singapore, the regulation of *karung guni* is not a priority for the Ministry of Environment and Water Resources (see also Portes & Sassen-Koob 1987). GvtSgp #1 claimed that the main reasons for monitoring (or not) *karung guni* has been linked to the government's commitment to the Basel Convention, and also to its efforts at reducing illegal dumping; however, in general, there have been few instances which have involved the arrest of *karung guni* because of their activities:

> In general, we try not to disturb *karung guni*,… they have to earn a living. Our main concern is when they cause too much noise pollution or become a nuisance. They too need to earn a living.
>
> (Interview with GvtSgp #1, Singapore)

Bypassing the system of licensing can sometimes have negative consequences, as seen in an event that happened two years ago in Singapore when the police and officials from the National Environment Agency clamped down on the activities of *karung guni* that were unlicensed (see also section 6.3.8). FEWSgp #4 opined that this unexpected turn of events reduced his profits significantly:

> Police were very strict and issued fines to people who didn't have it [a license]. Many of them [*karung guni*] are not registered, and there were serious supply problems. I ended up having to pay almost 15% higher than what I paid previously to bring in the quantities I needed. It hurt my business badly.
>
> (Interview with FEWSgp #4, Singapore)

As such, although *karung guni* are articulated with the rule of law in ways that can be restrictive in their activities, they also enjoy some freedoms in their survival strategies, and are largely not harassed by authorities in Singapore.

In contrast, one common occurrence that was brought up repeatedly in interviews with *karung guni* in Malaysia was the issue of corruption and bribes that needed to be paid to the police to ensure they would 'turn a blind eye'. Several scholars have documented the existence of corruption and bribery among the bureaucracy in relation to the informal sector (Bromley 1978; de Soto 1989; Blecker 2004; Chowdhury 2005). KGKul #6, a *karung guni* in Kuala Lumpur for almost twenty five years, shared that he has encountered multiple problems, is very visible to the police because he collects e-waste in the city centre:

> I have a lot of problems with the police, they always ask me for bribes, or I will be arrested. I lose about RM200 (≈ USD 60) a month

> because of that. There is very little I can do, the law does not protect us who are in this line.
>
> (Interview with KGKul #6, Kuala Lumpur, Malaysia)

Thirty-four out of 41 *karung guni* in Malaysia also opined the same experiences, and the amount paid out to the police ranged from MYR 10 – MYR 30 (≈ USD 3 – 9) every time they were 'caught'. This represents a significant loss of income for *karung guni* in Malaysia who earned only an average of MYR 800 – MYR 1200 (≈ USD 243 – 364) per month (KGKul #2, #5, #12, #14, #19, #20; KGPng #3, #4, #6, #7, #9). The widespread occurrences of practices of corruption in Malaysia have prompted several scholars to argue that the Malaysian government has been unsuccessful at cleaning up their act. In particular, Siddiquee (2009, p.339) argued that although several efforts have been made to address bureaucratic corruption in Malaysia, from the period of 1981 to 2009, "public bureaucracy in Malaysia continues to suffer from inefficiency, corruption and a host of other problems". In spite of this, not all law enforcement officers in Malaysia are corrupt, or are out to take advantage of the informal sector. GvtMys #1 suggested that the reason for their clampdown on the activities of *karung guni* was linked to the environmental pollution that they caused:

> There have been many problems with those that use very crude methods of dismantling and separating e-waste components in their homes. This is a fire risk and they pile e-waste in their gardens, polluting the ground with the leachates… and often collect water, resulting in a dengue problem in many of these areas. Constant monitoring is our only way to ensure that they are regulated.
>
> (Interview with GvtMys #1, Putrajaya, Malaysia)

Hence, whilst it may seem as though the bureaucratic practices of regulation of *karung guni* in Malaysia is riddled with corruption, the bureaucracy is also seeking a solution to the problem of environmental degradation that needs to be addressed, lest a situation like that in Guiyu, China, occurs where there has been widespread environmental pollution that has led to severe impacts on the health of the local population (Zhang 2009; Sepúlveda et al. 2010). To achieve this, several levels of government – from the federal, to the state and municipal – have undertaken legislative reform to ensure that Malaysia moves towards greener and more environmentally responsible practices, in particular with the disposal and management of waste.

### 6.3.2 The State as Provider of Subsidies and Social Services

Another dimension of the articulation of *karung guni* with the state is through the provision of social transfers to *karung guni* to aid in their survival strategies. These include providing free education to their children, rebates on utilities, food vouchers, and the provision of heavily subsidised public housing (see also Asim et al. 2012). UKGSgp #15, a *karung guni* in Singapore for almost six years, came into this trade after he was retrenched from a factory job, and has been receiving assistance from the government to finance his Housing Development Board (HDB) flat, and other household expenses:

> I receive subsidies from the government for my flat, and also for my children's education. We also receive rebates on our utilities bills since my wife and I are low-income earners.
>
> (Interview with UKGSgp #15, Singapore)

Similarly, LKGSgp #1, a *karung guni* in Singapore for almost twelve years, shared that government assistance was important for him, especially during times when his revenue was lower due to bad weather or when he was unwell and unable to work:

> I receive financial assistance from the government every month to help me with my bills. Since I live on my own in a rental flat, they heavily subsidise the utilities and also give me food vouchers, which are important especially during the times when I cannot collect a lot of e-waste because of heavy rains or when I go to places too late.
> (Interview with LKGSgp #1, Singapore)

Almost 90% of 46 *karung guni* in Singapore and all *karung guni* in Malaysia interviewed enjoy government subsidies, and many reported that the subsidies were crucial for their survival strategies. In effect, the subsidies received allowed *karung guni* to direct more of their revenues towards their working capital, to allow them to purchase more e-waste from households and smaller firms, and thus providing them with marginally more revenue to provide for themselves and their families. Taken in another way, these state subsidies to *karung guni* to assist them in their survival strategies can be understood to increase the competitiveness of *karung guni* in the e-waste recycling network, by increasing the proportion of their revenue that they can allocate to working capital. The significance of this *de facto* state subsidisation of *karung guni* trade has the effect of increasing the financial security of *karung guni* and the opportunities and capacity for value creation.

Practices of tax evasion were common amongst *karung guni*, both in Malaysia and Singapore – 30 out of the 46 *karung guni* interviewed in Singapore and 39 out of

41 *karung guni* in Malaysia – with these practices ranging from paying no income tax at all (i.e. those who declared themselves to be unemployed), or less than what they should be paying (i.e. those who under-declared their income levels). This raised serious ethical issues that I had negotiate, and was also a test of whether *karung guni* could trust me in assuring their welfare through participating in my research. When asked why they paid tax, in particular those in Singapore mentioned that they declared an income so as to continue enjoying government subsidies and assistance, as the Singapore government is a work-fare oriented system of welfare (see Lee 2000). LKGSgp #5, a *karung guni* for almost eight years in Singapore, shared how he did not always declare his income truthfully:

> I do pay income tax, but honestly, I declare much lower than what I actually earn. Otherwise, I will end up paying more tax for nothing. Every dollar is important for me.
>
> (Interview with LKGSgp #5, Singapore)

The Housing Development Board (HDB), a statutory board that is in charge of public housing projects in Singapore, is under the purview of the Ministry of National Development, and provides housing for almost 85% of the Singapore population (Lin & Tyabji 1991).[20] Whilst these flats are largely owned rather than rented, many Singaporeans rely on their Central Provident Fund (CPF), a government-run compulsory comprehensive savings plan, to finance their mortgages (Chua 2000; Chua 2003; Chua 2014). As such, contributions are made towards the individual accounts in CPF every month, and this money is used to

[20] Only Singaporean Citizens are permitted to purchase both newly built and resale public housing, while Singapore Permanent Residents are allowed to purchase public housing, but only on the resale market. Foreigners are only allowed to purchase private housing. (HDB 2014a; HDB 2014b).

offset the cost of the purchase of the flat (Lee 1998; Low 2004). The flats are sold at a subsidy from the government, and are generally within reach of most Singaporeans (Sin 2002). For most *karung guni* interviewed (34 out of 46 in Singapore), they often did not make regular contributions to their CPF as they are self-employed and part of the informal sector, and are not required by law to make contributions to the comprehensive savings plans (i.e. self-employed individuals are exempt from making compulsory contributions to their CPF). However, for *karung guni* who are unable to purchase their own flats, there are one-room and two-room rental flats available. Compared to flats that are owned, rental flats provide the tenants less housing security, as they can be evicted from the premises for failure to adhere to HDB regulations (HDB 2014c). In addition, the flats are rented out for a period of two years, with renewal subject to approval by the HDB. For LKGSgp #4, a *karung guni* living on his own in a one-room rental flat, the limited area inside his home left him with little choice but to clutter the common corridor with recyclable materials such as cardboard and bottles, whilst he kept the more valuable primary processed e-waste in his flat:

> My HDB flat is rented, and I have had trouble with them before. My neighbours complained that the walkway was cluttered, so I was visited by officers from HDB. They know I am *karung guni*, so they just told me that I had to store everything inside my home.
>
> (Interview with LKGSgp #4, Singapore)

For many *karung guni* who own their HDB flats and are still servicing their mortgage, their primary concern is often to ensure that they are able to make good their CPF contributions to ensure that they will not fall into arrears. UKGSgp #20, a *karung guni* living in a three-room flat with his wife and two school-going children,

highlighted the importance of his flat, as a loan from CPF would be the only way he would be able to purchase a home:

> I make contributions to my CPF but it is for me to be able to pay the mortgage for my flat. It is the only way I can take out a loan for such a long period without being worried that it will be taken back by a bank. No bank will offer me a mortgage… I don't have a steady income.
>
> (Interview with UKGSgp #20, Singapore)

Another concern emphasised by *karung guni* in Singapore was their fear that they would be evicted from their homes because they had violated HDB regulations because of their trade, or they would lose their homes as a result of being unable to service their mortgages. Their anxieties are common to petty commodity producers whose home-space and work-space are often one in the same.

Accordingly, the role of the state is highly influential in the strategies and potential for social reproduction that exist for *karung guni* in Malaysia and Singapore. Despite their similar position in the e-waste recycling network, *karung gunis*' ability to meet their daily needs are significantly shaped by state policies – particularly towards housing and basic necessities.

In terms of future financial security, *karung guni* in Malaysia and Singapore are both in similarly precarious situations, as they are self-employed and not required by law to contribute to pension funds or compulsory comprehensive savings plans. In contrast, in spite of the relatively cheaper property prices in Malaysia, more than 70% of the 41 *karung guni* reported that they were unable to make contributions to any comprehensive savings plans as they did not have enough

disposable income to even meet their daily needs on occasion. KGPng #7, a 60 year old divorcee who has been a *karung guni* for almost 40 years, shared his uncertainty about his financial future:

> I do not contribute to my *Kumpulan Wang Simpanan Pekerja* (Employees Pension Fund), and I really do not know what will happen when I retire. I don't earn enough money to make any contribution…This house is rented, so when I cannot work, I really don't know where I will go.
>
> (Interview with KGPng #7, Penang, Malaysia)

Although skills upgrading has been linked to improving the value capture potential of actors (Bair 2006), the upgrading of skills amongst *karung guni* in Singapore has been met with limited success, and has not resulted in significant gains in their value capture. This may be linked to the lack of relevance to *karung guni* work, whilst the skills gained through skills upgrading courses run by the Singapore Workforce Development Agency (WDA), have been oriented towards returning *karung guni* to the formal sector as waged labour. LKGSgp #3 who has attended a few of the courses run, shared:

> I have attended a few courses for accountancy and supply management organised by the WDA. It was insightful, but not really helpful.
>
> (Interview with LKGSgp #3, Singapore)

However, not all is lost through these courses. Some *karung guni* saw the courses as a means of self-improvement, so as to open the option to return to waged employment in the future, if they should so choose. UKGSgp #17, a *karung guni* for six years, and who worked as a deliveryman previously, shared:

> The courses teach computer skills, and provide food handling and food preparation certificates. I stopped school after Secondary Four, so this is important for me if I want to stop being *karung guni*.
>
> (Interview with UKGSgp #17, Singapore)

Therefore, the state continues to play an important role in structuring the lives of *karung guni*, through its legal framework, and the provision of public goods. In this subsection, I analysed the strategies of *karung guni* in relation to the state, and suggest that this relationship is not always antagonistic, but in reality, sees the state providing support to the survival strategies of *karung guni*. An argument can be made that the state, through its subsidy of *karung guni* is also subsidising capital. This may be considered in two ways: (1) by providing subsidies, the state takes off some pressure from *karung guni* during price negotiations with wholesalers and recycling firms – in this sense, if *karung guni* did not have subsidies, they would have to negotiate for higher prices for their sorted e-waste to provide for their daily survival; and (2) state subsidies contribute towards the social reproduction of *karung guni*, which for wholesalers and recycling firms translates into a stable supply of disguised wage labour.

### 6.3.3 Accessing Formal and Informal Financial Resources

Owing to the unpredictable levels of revenue that *karung guni* receive on a monthly basis, their access to formal financial resources is very limited. For itinerant waste buyers, although their fixed capital can be kept relatively low (i.e. to pay for a hand cart, with the exception of a lorry or goods van, which is the

biggest fixed capital investment), their working capital needs to be relatively high to allow for them to purchase large volumes of e-waste, so that they are better able to bargain with wholelsalers for better prices for their primary processed e-waste. As such, for *karung guni*, although they may be able to overcome their fixed capital requirements at the outset, it is the maintenance of a healthy amount of working capital that is instrumental in their ability to persevere in the industry. Indeed, the availability of working capital is essential to their survival, as a *karung guni* without sufficient working capital would be unable to purchase a significant and sufficient amount of e-waste from households and small and medium firms, thus leading to imminent failure. KGPng #12 worked previously in an electronics factory, but was retrenched and decided to become an itinerant waste buyer. With his wages from his factory job, he was able to purchase a house, and used the house as a collateral for a loan from the bank:

> I mortgaged my house to the bank so that I have sufficient money for day to day use,… for me to buy e-waste. Without this loan, I would have to go back to working for someone.
>
> (Interview with KGPng #12, Penang, Malaysia)

KGPng #12's choice to mortgage his home to allow him to continue working as *karung guni*, rather than having to return to being waged labour, was motivated by the flexible hours that being a *karung guni* afforded him as he needed to care for his elderly parents.[21] The flexible working hours to cater to reproductive commitments was similarly echoed in my interview with UKGSgp #7, a *karung*

[21] Similarly, other scholars have highlighted one of the motivations for remaining in the informal sector being the flexibility in time that is afforded (Breman 1996; Williams & Windebank 1998).

*guni* in Singapore for twelve years, who needed flexible working hours to care for his wife who is suffering from cancer:

> My flat was paid up many years ago, when the price was very cheap, so I was able to mortgage my flat for SGD 50,000 (≈ USD 39,900). The loan allowed me to continue as *karung guni*, and also helped me pay for my household expenses. The hours are good for me as I need to care for my wife.
>
> (Interview with UKGSgp #7, Singapore)

Nonetheless, access to formal financial resources remains a challenge for many *karung guni*. This situation is at times exacerbated by their inability to make regular contributions to comprehensive savings plans, or reluctance to pay a (higher) amount of income tax (see section 6.3.1 on tax evasion), resulting in low credit scores, which thus excludes them from loans from banks. KGPng #19 vented his frustration at the system:

> It is really difficult to get any money from banks. They said to me that I am self-employed… but my income is so low according to my income tax, I cannot qualify for a loan. But my declared income is low because I don't state my real income! Who would be so stupid as to do that?
>
> (Interview with KGPng #19, Penang, Malaysia)

A strategy used by a few *karung guni* in Malaysia and Singapore (KGKul #3, #7, #11, #19, KGPng #2, #15; LKGSgp #1; UKGSgp #2, #9, #14) has been the formation of a co-operative, whereby *karung guni* involved would be equal shareholders. The formation of a co-operative allowed for them to be registered with the government, and thus have access to loans from banks.[22] The significance

[22] Some scholars have identified the establishment of co-operatives as an effective strategy in the informal sector to pool resources and manpower to promote

of this move towards a co-operative may be conceptualised as a step towards labour organising amongst *karung guni*, and how this action has profound effects on the value creation and capture opportunities and potential for a collective group of *karung guni*. Recognising the challenges that face *karung guni* in labour organisation (such as the patchwork of licensed and unlicensed *karung guni* can result in only licensed/state approved *karung guni* being able to organise co-operatives; the geographical spread of their activities), more than half of the 46 *karung guni* in Singapore and around 40% of the 41 *karung guni* in Malaysia showed interest in or had personally explored the potential of establishing a co-operative. KGKul #11 shared his experience of registering as a co-operative with another 12 *karung guni* in Kuala Lumpur, Malaysia:

> A few of us [*karung guni*] set up a co-operative, with all of us having equal shareholding. This allowed for us to be registered as a company, and we were able to get a small loan from the bank that way. But it was a lot of challenges, and we only managed because one of us has friends who work for the bank. That helped in getting us a small loan of RM15,000 (≈ USD 4,590).
>
> (Interview with KGKul #11, Kuala Lumpur, Malaysia)

On the downside, KGKul #11 shared that as a result of registering with the Malaysian government, they had to pay a licensing fee, and their revenue was more closely monitored now. Nonetheless, he cited two main benefits from being registered: (1) that of being able to access formal financial resources; and (2) the harassment from police ceased, as all of them were now officially registered, and would not need to pay bribes.

---

greater efficiency and value creation and capture (Medina 2000; Baud et al. 2001; Mills 2003).

*Karung guni* who are unable to gain access to formal financial resources often turn to informal financial resources to get access to capital. In this instance, they are often subject to usurious rates of interest that *karung guni* said could range from 15-35%.[23] UKGSgp #3 shared his experience of taking out a loan from illegal moneylenders:

> I was running short on money, so I turned to loan-sharks. It was not the best solution, but the banks won't lend me money, so I had no choice. The interest was very high, around 20%, but I was lucky enough to be able to repay the amount in a month.
>
> (Interview with UKGSgp #3, Singapore)

Not all *karung guni* who take loans from illegal moneylenders are able to make their payments on time, as two of my respondents shared. They opined their experience of being harassed and even physically harmed.

Several *karung guni* also turned to formal pawnbrokers as a means of increasing their working capital (KGKul #4, #8, #19; KGPng #8, #19; UKGSgp #3, #5, #23, #35). By using personal items such as jewellery and mobile phones, they are able to get small loans that ranged from SGD 100 to SGD 500 (≈ USD 79 – USD 395), which was often put towards buying more e-waste. Indeed, many *karung guni* (38 out of 41 in Malaysia, and 33 out of 46 in Singapore) reported that they found pawnbrokers preferable to illegal moneylenders, as the interest rates were not as

[23] The lending of money at usurious rates of interest in the informal sector has been a focus of much research, and this has suggested that informal lending will continue to be a central strategy of the informal sector to gain access to funds that they would otherwise be unable to because of the lack of good credit histories that would allow them to borrow from formal financial institutions (Wood 1978; Germidis et al. 1991; Olsen 1993; Bose 1998).

high, but lamented that it also meant that they would not be able to get a large loan amount.[24] KGPng #21 suggested that being able to use the services of the pawnbroker were part of his survival strategy, and provided him a means of continuing as *karung guni*:

> I have had to pawn my wife's gold, or my ring or my watch at the pawnshop, just so that we have enough money to survive. In spite of this, I still will continue in what I do.
>
> (Interview with KGPng #21, Penang, Malaysia)

In a similar way, UKGSgp #37 shared that the money from the pawnbroker enhanced his working capital temporarily, thus permitting him to purchase more e-waste, and hence increase his overall revenue:

> The pawnshops are actually very important for me. It allows me to have enough money to tide over difficult times. With the money, I can buy more e-waste, which I sell at a better price because I have more volume.
>
> (Interview with UKGSgp #37, Singapore)

In summary, access to formal financial resources by *karung guni* remains low, but this does not mean that they have not found strategies to gain access, either through the formation of co-operatives, or the mortgaging of their homes. Informal financial resources are far more accessible, and are also important for *karung guni*, but their rates of interest are far higher than that of formal financial resources, to take into account the risk of default. The articulations of *karung guni* with financial resources/institutions are thus varied, but it is clear that their access to formal

[24] Pawnbrokers are used by the informal sector to gain access to money by providing a collateral. This collateral results in relatively lower interest rates compared to illegal moneylending (McGee 1979; Caskey 1994; Lall et al. 2006).

financial resources is limited by their lack of recognition in the formal economy. Importantly, this sub-section has addressed the challenges and opportunities that *karung guni* encounter in ensuring a sufficient amount of financial resources that are essential to them for their survival and continued ability to persevere in their trade. The relations of *karung guni* with financial institutions are thus highly influential to their continued existence, and indeed, to their value creation and capture capabilities and opportunities. In spite of the low levels of access to services provided by formal financial institutions, *karung guni* have managed to persevere in their trade, and have demonstrated the ability to increase their financial resources, both individually (through the mortgaging of their homes; pawning of jewellery) and collectively (through the formation of co-operatives). Indeed these are efforts shown by *karung guni* to maintain (and even increase) their value creation and capture opportunities and potential.

### 6.3.4 'Exploiting' Kin/Family

Family and kin relations are important avenues for *karung guni* to turn to in their survival strategies, and through *karung guni*, families too are articulated with the circuit of e-waste capital. For petty commodity producers, the family is a source of additional (free) labour power (Breman 1976a; Moser 1978; Cling et al. 2010).[25] As mentioned earlier, the distinction between work-space and home-space for *karung guni* is blurred because their disassembly, dismantling and sorting of e-

[25] Similarly, Philip Kelly (2009) has argued that it is important to consider the role and significance of local households and communities in production networks as complementary actors to firms and governments through practices of reproduction, migration and remittances.

waste often happens within their homes. Rather than a situation where work stops when labour leaves the factory, *karung guni* engage in a form of home-work, this notion being reinforced by the reality of their revenue that is through piecework, compared to an agreed wage.

All *karung guni* interviewed who lived with family members shared that their family members were often also involved in the processes of disassembly, dismantling and sorting of e-waste. After *karung guni* have transported e-waste back to their homes, their family members would sit around and assist. In this sense, while *karung guni* often operated on their own in terms of collecting e-waste, the dismantling, disassembling and sorting was often carried out by a family unit, rather than *karung guni* alone. Defined by Tsing (2009, p.158) as "exploitation greater than might be expected from general economic principles", super-exploitation is a common occurrence among the households of *karung guni*. *Karung guni* are super-exploited because their families are also involved in the labour process, although they are not remunerated or receive revenue for their labours (see Harriss-White 2012). Xue and Chan (2013) argue that super-exploitation lowers labour costs significantly, while increasing output, and creates greater poverty in urban communities. UKGSgp #26 lamented that his family had to help him with his work, otherwise he would not be able to make enough money to provide for his family:

> When I bring my collected e-waste home, my wife and daughter also help me in dismantling and sorting, especially after dinner, or in the mornings. My wife does not work, so this is our only source of income.
>
> (Interview with UKGSgp #26, Singapore)

This situation of self-super-exploitation by *karung guni* is exemplary of the informal sector, where family members are drawn upon to provide additional labour in the labour process (see also Gill 2009; Meagher 2010). The labour of children is also articulated with the capitalist mode of production in these cases, as seen in the example of UKGSgp #26's twelve year-old daughter who helps mainly with the removal of microchips, capacitors and resistors from circuit boards using a pair of pliers, and in the case of KGPng #4, whose two sons, aged fifteen and seventeen, help him with the work of disassembly and dismantling of television sets and air-conditioner units:

> My sons help me with the dismantling whenever they come back from school. That allows me to continue going door-to-door during the day time… in the evening I will do the sorting and make sure that the dismantling was done correctly.
>
> (Interview with KGPng #4, Penang)

Family members are also important in providing financial support to *karung guni*, and form an alternate source of financial resources. Of the *karung guni* interviewed, almost 80% of them reported to be receiving money from their children, ranging from around MYR 50 – MYR 200 (≈ USD 15 – USD 61) per month for those in Malaysia, and SGD 100 – SGD 300 (≈ USD 79 – USD 237) for those in Singapore. The added finances are vital for *karung guni* who are living on a very tight budget and are indeed another subsidy to capital. UKGSgp #12 described how the money was used as part of his survival strategies:

> My children are quite good, they know I don't earn enough sometimes, so they will give me SGD 200 (≈ USD 159) to help me.

> But they don't earn much also… my daughter is a supermarket cashier, and my son is a deliveryman.
>
> (Interview with UKGSgp #12, Singapore)

As discussed in section 6.3.3, *karung guni* experience great difficulties in securing loans from formal financial institutions. Although they themselves have difficulty, a few *karung guni* shared that they were able to get bank loans through their family members, and this aided them in increasing their working capital (KGKul #1, #4; KGPng #18; LKGSgp #6; UKGSgp #28, #33). UKGSgp #33 who is in his 60s, whose son is a lawyer, secured a bank loan through his son, and this allowed him to increase the volume of e-waste that he buys from households and small commercial firms:

> My son helped me to loan SGD 10,000 (≈ USD 7,965)from the bank. He is a graduate, and does not like me doing this job,… but then I still want to do this. So he took the loan and gave me the money.
>
> (Interview with UKGSgp #33, Singapore)

Support from family and kin are not limited to just financial resources, but are also seen in the reproductive spheres, which allow *karung guni* to work for longer hours, and to travel further to collect e-waste. For example, LKGSgp #3 relies on his mother-in-law to assist him in child-minding responsibilities:

> My wife works as an assistant at a fruit stall, and we have a son who is two years old. I am thankful that my mother-in-law takes care of Robbie during the day. Without her, we would have to pay for childcare services that we cannot afford.
>
> (Interview with LKGSgp #3, Singapore)

Nonetheless, the overlapping of home-space and work-space can cause tensions in the household. The home as site of production blurs not only the temporality of work, but also the geographies of work, and it is this dual nature which often brings about conflicts.[26] KGPng #19 described the irritation his family felt towards the mess that was in the home as a result of his trade:

> My home is my office, my factory, and my warehouse. But home is so small, I cannot store a lot of things, so I also use my garden. But still I must, otherwise how to sell to anyone? No one will buy just a small amount. If I sell in such small quantities, I will surely lose out. My family tolerates the mess because there is no other way for me to have income.
>
> (Interview with KGPng #19, Penang, Malaysia)

Similar to the above-mentioned issue of irritated family members, another problem that is faced by *karung guni* because of the limited home-space available for them to store e-waste has been the risk of eviction because of fire regulation violations. UKGSgp #3 has received multiple written letters from HDB cautioning him about cluttering the common corridor:

> HDB officials have come many times, and I have been issued with many warnings about fire hazards I cause along corridor. But in this two-room flat, I have stored 120 computers before. At worst, I sleep in my chair. But if HDB takes away my flat, and I am forced to be in a one-room rental flat, I will lose everything.
>
> (Interview with UKGSgp #3, Singapore)

Familial and kinship ties are important to the survival strategies of *karung guni*, and through the help they render to *karung guni*, family and kin are indirectly

[26] Several scholars have examined the politics and practices of home-work, and have argued that this practice of working at/from home is a strategy to reduce costs by bringing down overheads related to renting/buying commercial spaces for work (Gill 2009; Meagher 2010; Ekinsmyth 2011).

articulated with the regional e-waste recycling network in Malaysia and Singapore. Importantly, I argue that support from family and kin of *karung guni* have the effect of subsidising capital by increasing the amount of risk internalised by *karung guni*. In this sense, the assistance rendered to *karung guni* by family and kin – in terms of (1) time and effort in helping to dismantle and sort e-waste, and (2) financial support – reinforces the argument that *karung guni* are super-exploited in the regional e-waste recycling network, and are only barely able to eke out a living through their *karung guni* activities.

### 6.3.5 Increasing Productivity Through Technology

Several *karung guni* shared their experiences about how their collection rounds had become more productive ever since they purchased lorries to assist in transporting their collected e-waste (KGKul #5, #13, #17; KGPng #2, #5, #18; UKGSgp #2, #8, #14, #17, #22, #31, #37). The rental or purchase of lorries allows them to collect more e-waste on each collection round, rather than being limited to what their pushcarts can carry. In addition, the lorries enable *karung guni* to increase their geographical reach, hence increasing their ability to collect more e-waste from a variety of locations, rather than just within the estates where they reside. UKGSgp #14 explained how his lorry enabled him to improve the productivity of his collection rounds:

> I first began with just a normal trolley, and had to cart individual television sets and a few VCRs at any one time. After this, I would have to return home to deposit these before I go out to collect more. But now, I have my own lorry, for almost seven years now, and

> things are so much better. I can collect much more before going back home, and I can lock it [e-waste] in the cage behind my lorry. I can also go many more places to collect e-waste.
>
> (Interview with UKGSgp #14, Singapore)

There is sometimes commercial cooperation amongst *karung guni*, both in Malaysia and in Singapore, especially when there is more to be collected from households. During the seasons of Chinese New Year and *Hari Raya Puasa* (the Malay New Year) where many households do a massive housecleaning, *karung guni* will cooperate in pairs to increase the pace and volume of their collections. On other occasions, cooperation between *karung guni* has occurred due to the exorbitant prices of goods vehicles in Singapore. The Certificate of Entitlement (COE) is an integral part of a quota licensing system that regulates the total volume of vehicles in Singapore. A successful bidder receives a COE that grants the holder the legal right to register, own and utilise a vehicle in Singapore for a period of ten years. To be able to own a goods vehicle, a COE that allows a vehicle to be on the road for 10 years, must first be obtained, which in April 2014 stood at SGD 49,503 (≈ USD 39,602) (Land Transport Authority, Singapore 2014). The price of attaining a COE is added to the purchase price of the vehicle, and is a very large cost. As a result of this, some *karung guni* (8 out of the 46 *karung guni* interviewed in Singapore) have begun working as pairs or in teams to share the cost of the vehicle. This practice is still relatively uncommon, but may become more prevalent if the price of vehicle ownership continues to rise from its present levels (UKGSgp #11, UKGSgp #20, UKGSgp #37, LKGSgp #2).

The goods lorry is an essential component to *karung guni* being able to practise their trade, due in large part to the bulky and heavy nature of electronic products such as television sets, and computers that need to be transported by *karung guni* to their homes for processing before being sold. All the *karung guni* in my study variously owned, shared or had access to a goods lorry that they used whenever they went on their collection rounds. UKGSgp #19 opined:

> There are times when I work with *Ah Ben* [another *karung guni*], and we do our rounds together. It is faster that way, and we can also collect bigger things like fridges, air-conditioning units and big televisions. Otherwise, working on my own, these products are very difficult for me to handle. But I don't know how long I will be able to do this on my own anymore. My lorry is already almost ten years old. *Ah Ben* asked me if we should buy a lorry together instead, since his is also going to be ten years old soon. This COE is really causing us a headache.
>
> (Interview with UKGSgp #19, Singapore)

These *karung guni* related how they had seen a significant increase in their revenue ever since they began using a lorry, in spite of the additional costs involved. It was even suggested by a few *karung guni* that the lorry had become an essential tool for their trade, and that without a lorry, or a means of transporting larger volumes of e-waste, they would be unable to continue with their work due to being unable to even meet their daily living expenses through their collections (KGKul #13; KGPng #18; UKGSgp #17, #31). UKGSgp #2 suggested that the lorry was so important to his collection that "without my lorry, my earnings might fall at least 70 percent".

Despite the benefits that the lorry has brought to *karung guni*, it has also brought them into increased conflict with each other, as seen when two or more *karung guni* attempt to collect e-waste in the same estate simultaneously. The use of a lorry has increased the footloose capabilities of *karung guni*, and allows them to increase their opportunities for value creation through an increased volume of collected e-waste. However, it has also increased the possibility of other *karung guni* coming onto 'their turf' and thus competing with them for the share of e-waste that is available for collection (see also section 4.4).

Although most *karung guni* (41 out of 46 *karung guni* in Singapore, and 34 out of 41 *karung guni* in Malaysia) owned their own lorries, 12 of those interviewed stated that their lorries were not their own, but rather, owned by an e-waste wholesaler to whom they paid a fixed monthly rent. To what extent did this mean that they were obliged to sell their collected e-waste to the owner of the lorry, or to give the e-waste wholesaler a percentage cut of their earnings? Whilst all but four indicated that they enjoyed relative autonomy in their choice of whom to sell their primary processed e-waste to, four *karung guni* stated that on top of the rent they pay to the wholesaler for the use of the lorry, they were obliged to sell the primary processed e-waste to the wholesaler at a price that was usually around ten percent lower than what they would get selling to other wholesalers (KGKul #2, #7; KGPng #4; UKGSgp #34). However, two of these four *karung guni* opined that the wholesaler that they sold their primary processed e-waste to would usually permit them to sell their e-waste to other wholesalers, but only after they had decided that they had no need for the primary processed e-waste that the *karung guni* had available for sale (KgKul #2; KGPng #4). Hence, for *karung guni*, technology – in

the form of lorries – has a significant impact both on the geographies and the efficiency and productivity of their collection of e-waste. First, there is an increased foot-looseness of *karung guni* activity, where they are thus able to cover a great geographical area in a shorter amount of time. Second, compared to much smaller hand-carts and pedal carts, lorries enable *karung guni* to collect much more e-waste per trip, thus contributing to an increase in value creation opportunities.

### 6.3.6 Subversive Methods

Through engaging in subversive strategies to negotiate their relative powerlessness in shaping the e-waste circuit of capital, *karung guni* have devised means of ensuring their own subsistence and economic survival.[27] *Karung guni* often engage in attempts to increase their value capture through actions that allow them to artificially increase the volume of sorted e-waste that they have available to sell to e-waste wholesalers. Around 80% of the 46 *karung guni* in Singapore, and around 90% of the 41 *karung guni* in Malaysia shared that they have engaged in some form of deception (e.g. using fillers or not separating the e-waste components entirely, so as to increase the weight of the sorted e-waste). In the case of *karung guni* in Singapore, all 46 reported that they had experiences of receiving cash payments from e-waste wholesalers and electrical and electronic repair shops, a practice that is not permitted by the *Secondhand Goods Dealers Act 2007*. Undoubtedly, the strategies of *karung guni* that "transform lower-class

[27] James C. Scott (1985) discussed the many strategies used by peasants in Indonesia to increase their economic stability, in what he termed the "weapons of the weak".

actors into social and deliberate beings" (Scott 1987, p.418), are driven by intentions to survive, and they formulate these strategies as means of coping with their daily struggles for existence and subsistence.[28]

The use of fillers by *karung guni* was particularly obvious in their sale of copper wires to e-waste wholesalers. In this case, *karung guni* would first remove the plastic casing protecting the copper wires by either burning it in a disused oil drum that results in the release of toxic and noxious fumes into the atmosphere, or by manually stripping it using a pair of pliers. The former method is much more efficient as it allows for a large quantity of wires to be stripped at one go. I observed this practice on nine occasions. These occurred in Malaysia, and were always away from the city centre. Carried out in open spaces – usually back gardens or open fields – a far distance from the city centre ensured that authorities would be less likely to be able to catch *karung guni* for these environmentally polluting activities. In Singapore, the stripping of plastic to reveal the copper wires was most often carried out manually using a pair of pliers and usually took place within the confines of the home-space. This practice is much more labour intensive, but is undeniably much more environmentally friendly as compared to burning the wires. These stripped copper wires would then be wound up in bundles and placed in black garbage bags or large baskets, ready to be transported to wholesalers to be sold. In terms of using fillers, KGPng #5 informed me that he would take the aluminium outer casings of computers and cut them into strips

[28] A recognition of this ability of workers to practice resistance to the demands of capital is closely related to a re-conceptualisation of workers as "sentient", and able to engage in activities to advance their own agendas (Herod 1997; Castree et al. 2004; Coe & Jordhus-Lier 2011).

using a pair of metal shears, which he would mix in with the copper wires in the bag, thus increasing the weight of the 'copper wires' (KGKul #3, #7, #12, #17; KGPng #2, #7, #14, #17; UKGSgp #6, #18, #22, #25, #33). Importantly, the use of aluminium outer casings empowered *karung guni* to capture more value in the regional e-waste recycling network than what they would normally be able to. The additional revenue received by *karung guni* is linked to the world prices of aluminium and copper, where the price of copper (USD 7,313.50/tonne) was almost four times that of aluminium (USD 1,717.50/tonne) at the end of 2013 (London Metal Exchange, n.d.). As such, by selling aluminium strips-tainted copper wires, *karung guni* are able to increase the amount of value they capture from the e-waste circuit of capital.

However, this strategy of using fillers has been employed in such a widespread manner that it has eroded the social relations of mutual confidence and dependence between *karung guni* and e-waste wholesalers (see section 5.4). The practice of deceiving e-waste wholesalers has resulted in many paying less to *karung guni* with whom they are unfamiliar. FEWSgp #3 shared that, in general, he is more willing to give a higher price for copper wire and other primary processed e-waste to *karung guni* with whom he has a more established relationship. When probed about how he differentiated between *karung guni*, FEWSgp #3 suggested that:

> With some karung guni, they have been supplying me with copper wires for more than five years now. I know they will not cheat me… and they have not cheated me before. For them, I am willing to pay 5% to 10% more than I would pay to someone I have never bought from before. For all I know, that new karung guni may just be a fly-

> by-night scenario. When I first began, I was stupid... trusted people too easily, and lost money.
>
> (Interview with FEWSgp #3, Singapore)

As a result, the organisation of the regional e-waste recycling network is structured in such a way that *karung guni* prefer to sell to e-waste wholesalers whom they perceive as honest, and oftentimes sell only to a small handful with whom they have had regular transactions. Counter-intuitively, this strategy of using fillers has placed *karung guni* in relatively captive relationships with e-waste wholesalers, thus setting the scene for possible exploitation by e-waste wholesalers who are increasingly aware that *karung guni* are not free to bring their wares to be sold at the door of any and every e-waste wholesaler.

In this sense, although the use of fillers as a method to increase their value capture in the e-waste circuit of capital has been rather widespread amongst *karung guni*, it is ultimately counterproductive since *karung guni* end up in a relatively weaker bargaining position as they are no longer able to enjoy the ability to sell to a large number of e-waste wholesalers – not unless they are willing to tolerate lower prices until social relations of mutual confidence and reliance have been established.

Peculiar to Singapore, where the *Secondhand Goods Dealers Act 2007* stipulates that all financial transactions between parties who handle secondhand goods must be facilitated by crossed cheques, a second subversive means that *karung guni* and other actors in the regional e-waste recycling network engage in is the use of cash

payments instead of cheque payments (Singapore Police Force, n.d.).This provides a means of circumventing taxation. In this instance, although all actors within the e-waste recycling network in Singapore can hypothetically practice this method of subversion to capture more value by circumventing the law, the practice of preferring cash payments is most prevalent amongst *karung guni* (42 out of 46), formal and informal e-waste wholesalers (10 out of 11), and electrical and electronic repair shop owners. All eight full recovery e-waste recycling firms in Singapore declared that they would be running foul of the law if they engaged in such practices, and as their firms are audited on a regular basis there would be ramifications from participating in such subversive acts. Even when probed as to whether they would use cash in purchasing small quantities of wholesale e-waste from e-waste wholesalers or *karung guni*, only two out of eight (FRERSgp #3 and #6) admitted that they had done this before and still do so on a regular basis.

In this sense, although *karung guni* and others who practice this form of tax-evasion are running foul of the law, they are using this tactic as a means of increasing their value capture by reducing the revenue they lose in tax, licensing and auditing requirements. In addition, there is an added dimension of convenience that cash payments provide, as argued by UKGSgp #22:

> If I accepted cheques, then I would need to go to the bank, and wait for the cheque to be cleared before the money is credited to my bank account… before I can withdraw the money. Sometimes I don't even have enough money to eat a meal,… do you expect me to wait for the cheque to clear?
>
> (Interview with UKGSgp #22, Singapore)

Indeed, the time lag between the submission of a cheque at a bank and when the funds become available in a *karung guni*'s bank account can cause distress for *karung guni* who require the money almost immediately for their daily subsistence (LKGSGP #1, #4, #6; UKGSgp #7, #9, #17, #22, #35). In addition, the time lag (usually between 24 to 48 hours) can temporarily curtail the value creation opportunities available to *karung guni* by reducing the amount of capital they have at hand to purchase e-waste from households and small commercial firms. Moreover, conducting transactions in cash benefits e-waste wholesalers who do not record these transactions in their books, which allows them to use this method to avoid taxation. Out of ten e-waste wholesalers in Singapore who regularly used cash payments with *karung guni*, eight reported that their main motivation was to reduce their tax commitment by under-declaring the volume that is traded, whilst the other two (who were formerly *karung guni* themselves) stated that their motivation was out of empathy for the plight of *karung guni*, since they were themselves acutely aware of the need for *karung guni* to receive payments in hand as rapidly as possible in the form of cash that can be used immediately, as opposed to having to wait for banks to process cheques.

This subsection has explored two subversive methods adopted by *karung guni* (with the co-operation of wholesalers) in an attempt to increase their value capture. Practiced both in Malaysia and Singapore, the first method of using fillers has however backfired, and resulted in *karung guni* being placed in a relatively captive relationship with e-waste wholesalers. In the context of the *Secondhand Goods Dealers Act 2007* in Singapore, the second method of cash payments places parties operating in Singapore in precarious positions as they run the risk of being

apprehended by the police for this illegal practice. In effect, these practices are aimed at increasing value capture, and indirectly, the value creation opportunities of the actors involved. In the next section, I interrogate the spatial strategies employed by *karung guni* to increase their value creation opportunities by establishing temporary spatial monopolies.

### 6.3.7 Temporary Territorial Capture

Access to e-waste forms the basis for the value creation opportunities among *karung guni*. To ensure access to a steady supply of e-waste, *karung guni* engage in spatial tactics involving the creation of a form of temporary territorial capture in a limited geographical area, so as to maximise their opportunities to collect e-waste from households. In this sense, individual *karung guni* would, for a limited time period, be able to gather e-waste from that specific geographical area without having to compete with other *karung guni* threatening to operate in the same geographical area at the same time (see also section 4.4.2). In Singapore, to increase their potential to collect more e-waste, *karung guni* have established a common set of norms, specifically a territorially-based relation, that allows an individual *karung guni* to undertake their collection rounds in a housing estate without encountering competition from another *karung guni* for the time that they are there. This common understanding among *karung guni* in Singapore has been in place for a long time. UKGSgp #18 explained this practice:

> When you see a karung guni in an estate that you want to go in to, if he is there already, you don't go over and cause trouble by

> competing with him. You wait somewhere out of sight, or you just go to another estate. This is the way we [karung guni] do things. I respect that he arrived before me, I let him have his time to collect. When he is done, I may go and collect in that estate. In the same way, if someone else comes, they also know to let me have my turn. Usually the collection round in one estate is around one hour… This is the way it has been for years, since when I started more than thirty years ago.
>
> (Interview with UKGSgp #18, Singapore)

In this way, temporary territorial capture is practiced by individual *karung guni*, which permits them to maximise the amount of e-waste they can potentially purchase from households in the geographical area where they have temporary territorial capture a greater amount of e-waste compared to if they had to compete with another *karung guni* in that same time period.

A very different set of social relations exists amongst *karung guni* in Malaysia. The code of conduct that exists amongst *karung guni* in Singapore does not apply to *karung guni* in Malaysia. This may be attributed to the larger geographical size of Penang and Kuala Lumpur, and as such, the likelihood of two or more *karung guni* being in the same location at the same time is significantly lower. Individual *karung guni* in Penang and Kuala Lumpur actively seek to establish close relationships with small and medium commercial firms so as to increase their access to e-waste. In this way, individual *karung guni* aim to be the "*karung guni* of choice" by the small and medium commercial firms when they have e-waste to dispose of, and thus increase their opportunities at value creation through an increase in e-waste volume. Through this method, *karung guni* in Penang and Kuala Lumpur are able to increase their value creation opportunities by having

exclusive access to e-waste from firms with which they enjoy intimate trading relations.[29] KGPng #12 suggested that this form of relationship building was important in ensuring that he had a steady supply of e-waste:

> To establish these relationships, you rely on personal contacts. Once you are the first karung guni that a firm calls whenever they have e-waste, you have struck gold. How do you become their first option? Make sure you respond to their call as soon as you can. Pick up the call, and go down to collect the e-waste within two hours if possible. The faster you pick it up, the more likely it is still there. The firms don't care if you they told you about it. If you don't come quick, they find someone else, and it's gone. You need to react quickly.
>
> (Interview with KGPng #12, Penang)

Social relations established between individual *karung guni* and small and medium firms enable *karung guni* to have preferential access to e-waste from these firms. Temporary territorial capture, and preferential access to e-waste from specific small and medium firms through social relations have the effect of increasing the value creation opportunities for *karung guni*, since a greater volume of e-waste may lead to a greater opportunity for increased revenue through a larger volume of e-waste available for the *karung guni*'s labour to transform into primary processed e-waste. In this section I have unpacked the practices of temporary territorial capture and preferential access to e-waste by *karung guni* – strategies that have been employed by *karung guni* in Singapore to ensure social reproduction and their daily survival. Importantly, these strategies are enacted in

[29] In a similar way, Reddy (2013) highlighted the importance informal e-waste recyclers attached to establishing direct contact and personal relationships with facility managers of IT companies in Bangalore to create de facto 'rights' to the e-waste This was done in the hope of increasing the revenue that they received.

an effort to gain 'exclusive' access to e-waste, and thus increase the value creation potential of the *karung guni* involved.

As argued by David Harvey, drawing on Marx, the continual flow of capital from one form to another is vital in the continued creation of surplus value (Harvey 2011; Pani & Holman 2013). As such, disruptions to the smooth flow of capital from one form to the next can have significant implications for the opportunities at value creation and capture. In the following section, I analyse the strategies employed by *karung guni* in creating disruptions to the e-waste circuit of capital (Figure 5.1), and the motivations which drive these actions.

### 6.3.8 Hoarding of Primary Processed E-Waste

One of the strategies used by *karung guni* in Singapore involved the hoarding of primary processed e-waste which induced a reduced supply of primary processed e-waste thus causing a rise in their price. Although the strategy employed was similar to the wholesalers discussed in section 5.5.3 in terms of affecting the supply of e-waste, due to the very different economic capabilities of *karung guni* and e-waste wholesalers, the actions of *karung guni* were only able to be sustained for a limited period and thus resulted in different levels of response by the market. *Karung guni* in Singapore are limited in their ability to hoard by two factors. First, the practice of hoarding requires physical space to accumulate and store e-waste, which is unavailable to *karung guni* in Singapore due to the limited space in their homes where they store e-waste. Second, by hoarding e-waste, *karung guni* have their capital fixed in the commodity form (see Figure 5.1, Stage 4) as primary

processed e-waste. In this case, *karung guni* who have limited financial resources are constrained in their value creation opportunities by the lack of money since this disruption to their cash flow prevents them from purchasing more e-waste from households and small and medium firms. *Karung guni* in Singapore have limited access to legal and illegal short-term loans (see section 6.3.3), and are thus unable to continue with their regular business of purchasing sorted e-waste due to the stockpile that they may be accumulating. Taken together however, the practice of hoarding is a strategy that is employed by *karung guni* to negotiate a better price for their e-waste by influencing the supply of e-waste available to particular buyers.

In the case of *karung guni* in Singapore (LKGSgp #1, #3, #6; UKGSgp #12, #15, #23, #36), in their separate interviews recounted an incident which occurred in 2007 that resulted in an uncoordinated hoarding of primary processed e-waste by *karung guni* in Singapore. Due to changes in legislation (the *Secondhand Dealers Act* was revised in 2007 as the *Secondhand Goods Dealers Act*), all transactions amongst secondhand goods dealers, which included *karung guni*, e-waste wholesalers and electrical and electronic repair shop owners, were to be carried out with proper book-keeping and accounting practices, and had to be facilitated by cheque payments as opposed to cash payments as had previously been allowed (see also section 5.3.3). In response to this change in legislation, several *karung guni* were unsure about whether their practices would be under greater scrutiny, and as a result hoarded their primary processed e-waste. This uncoordinated hoarding led to a decline in the volume of primary processed e-waste available for purchase by e-waste wholesalers and the e-waste recycling firms that they supply

to. This resulted in local prices for primary processed e-waste increasing by an average of 10% to 15% over a month (FEWSgp #3, #2; PRERSgp #5). However, this unintended primary processed e-waste scarcity was quickly overcome by the need for *karung guni* to sell their e-waste. Without the ability to sell their primary processed e-waste, *karung guni* were unable to purchase more e-waste from households and small commercial firms. As such, many of them, at least in the initial period of implementation of the new legislation, were willing to accommodate the inconvenience caused by the new requirement for cheque payments. This incident, although it was not motivated by *karung guni* intentionally causing a bottleneck in the e-waste circuit of capital, is indicative of the potential power and influence that *karung guni* may effect on the rest of the regional e-waste recycling network albeit a strategy constrained by cash flow and coordination problems (e.g. cheating).

### 6.3.9 Rental Spaces and Moonlighting

Access to retail space is difficult for *karung guni* since they are not licensed, neither are they registered as a company, and in this way they are articulated through their rental of shop-space from shop-owners who are willing to sublet to them. The subletting of retail space by the formal sector to *karung guni* is a legal grey area that can put both *karung guni* and shop-owner at risk of being evicted from their premises. In Singapore, all public housing estates have commercial centres that provide retail and commercial services to residents in the area. Shop premises are leased or sold according to regulations set out by the HDB, including the type of economic activity permitted and the hours of business (Yeo et al. 2012; Yeo & Heng

2014). Although subletting is permitted, all forms of subletting must receive written approval from the HDB. However, this does mean that the income received by the shop-owner is also monitored by the government, and reduces the amount of money that shop-owners stand to gain. To circumvent this requirement, shop-owners allocate areas within their shop to *karung guni* to act as their in situ e-waste collection point, but only with mobile display cases that can be hidden away easily. Without any advertisements, these illegal operations are often tucked into the back of shops, where they have a simple glass display case, usually with second-hand mobile phones that are available for purchase.

LKGSgp #6 rents a shop-space in Bukit Batok housing estate and shared his experiences:

> I pay is about SGD 350 (≈ USD 278) per month… [for a] very small area,… that is all I need. I have this place mainly to buy e-waste from customers who walk in. On average I get about 80 to 100 mobile phones a week, and about 30 laptops and computers this way. Usually my wife is at the shop, not me. I am out collecting from door-to-door.
>
> (Interview with LKGSgp #6, Singapore)

The rental of shop space is also common in Penang and Kuala Lumpur, where I noticed that several e-waste buyers had shop fronts that reportedly sold other goods, ranging from pharmacies to bicycle repair shops. Of those interviewed, many of these e-waste buyers were also actively involved in door-to-door collections, but used the shop space when they were on their 'rest' days. At other times, their family members would assist them by staffing the shop. KGPng #17 who rents a small shop space at the back of an electrical shop, shared:

> I pay rent to the shopkeeper so that I can use some of his shop to collect e-waste from people who deliver it themselves. I pay about MYR 400 (≈ USD 122) a month to him, which is very low, but this is all illegal. I pay customers more for what they sell me here compared to when I collect it from their home.
>
> (Interview with KGPng #17, Penang, Malaysia)

Besides renting shop space to increase their value creation opportunities, engaging in forms of paid work on top of being *karung guni* was common among *karung guni* interviewed in Malaysia and Singapore. Almost 45% of 46 *karung guni* interviewed in Singapore and 60% out of 41 *karung guni* in Penang and Kuala Lumpur declared that they did other work besides being *karung guni*, and included working in the night at a fruit stall, to being a coffee-shop assistant, and a cleaner. Although they worked two shifts, all *karung guni* who reported this opined that their primary source of income was from revenue as *karung guni*, with their side-job supplementing their revenue by an average of 30 – 40%. The holding of two or more jobs is common in the informal sector, where income levels are low, and one of the most common survival strategies to improve revenue is by extending the working hours of the day (Alden 1981).[30] UKGSgp #20 and KGPng #7 shared their experiences of 'moonlighting':

> I work as a coffee-shop assistant on weekends, but on weekdays I am *karung guni*. If I do not do both jobs, I won't be earning enough.
>
> (Interview with UKGSgp #20, Singapore)

[30] Henry (1981, p.15) argues that 'moonlighting' is an effective strategy to increase financial security, and contends that "[i]nsofar as the participants in the black economy are not registered and do not meet the kinds of laws that have been established to regulate economic behaviour such as taxation and fair trading laws, then they are illegal but are not, as Dow (1977) points out, on the whole criminal".

> During the day I go around collecting e-waste from about 9am till 4pm. Then I rest for about one hour and begin work at 6pm till around 10pm helping to sell fruit at my friend's shop in town.
>
> (Interview with KGPng #7, Penang)

Therefore, the varied ways in which the informal sector is articulated with global production networks point to the diversity of economic practices that are undertaken by the urban poor in their strategies to survive. In spite of the present nascent developments in the e-waste recycling network in Malaysia and Singapore – including the emergence of *karung guni* co-operatives, and the licensing of *karung guni* to enable them to gain access to formal financial resources – the articulations of *karung guni* with regional e-waste recycling network on exploitative terms will persist as long as *karung guni* are unable to formulate and enact strategies to increase their value capture.

## 6.4 Conclusion

In this chapter, I have sought to unravel the complex articulations of the informal sector with the e-waste global production networks, looking in particular at *karung guni*. In section 6.1, I presented a brief theorisation of the informal sector in relation *karung guni* and petty commodity production. In section 6.2, I conceptualised *karung guni* through the lens petty commodity production, and demonstrated how this may enrich the understanding of the articulations of *karung guni.* In section 6.3, I unpacked the various strategies which *karung guni* employ to secure their economic survival, and how they are articulated with the capitalist mode of production, arguing that their surplus value is appropriated by capitalist firms, as outsourced labour and disguised wage labour. Through the lens

of petty commodity production, in this chapter I have argued that *karung guni* are a contradictory unity of capital and labour through their ownership of both the means of production and their labour power. In addition, I have analysed the various methods that *karung guni* have engaged in to ensure their subsistence, sustenance and continued survival. Importantly, these strategies are motivated by their need to secure their social reproduction and survival.

Three differences and seven similarities between the strategies of *karung guni* in Malaysia and Singapore may be identified in this chapter. Of the three differences, two of them are grounded in the different geo-political contexts (institutional contexts) that *karung guni* operate within. First, a licensing system to regulate the activities of *karung guni* exists in Singapore (although it may not be very strongly enforced), but this does not exist in Malaysia, although attempts have been made to formalise them as well. Related to this, is the relationships of *karung guni* with police officers. As discussed earlier, practices of corruption are apparent, where police officers extort money out of *karung guni* so as to not harass them. On the other hand, *karung guni* in Singapore have a more benign relationship with police officers (particularly *karung guni* who are licensed), and have called on police officers to assist them in situations where they have noticed foreigners collecting e-waste. Second, and relatedly, the *Secondhand Goods Dealers Act 2007*, which is a piece of legislation peculiar to Singapore, places pressures on *karung guni* in Singapore by slowing down the pace at which they are able to purchase e-waste. In contrast, *karung guni* in Malaysia operate on a cash basis, without this impediment to their daily rounds of collection, primary processing and subsequent sale of e-waste. The last difference identified in this chapter is that of the strategies

employed by *karung guni* in Malaysia and Singapore to gain 'exclusive access' to e-waste. In Malaysia, *karung guni* establish preferential access to e-waste from small and medium firms by building close relationships with them. In contrast, *karung guni* in Singapore operate within a set of norms that allows individual *karung guni* to have temporary territorial capture, thus allowing for them to maximise their value creation opportunities during a round of collection.

Seven similarities may be identified from the strategies employed by *karung guni* in Malaysia and Singapore. First, they rely heavily on the subsidies received from the government including housing subsidies, utilities subsidies, free education for their children, and food vouchers. As argued earlier, the effect of these subsidies is that while it provides assistance to *karung guni* who are eking out a living, these policies are also subsidising capital by reducing the pressures placed on *karung guni* to negotiate for higher prices for their primary processed e-waste. Second, *karung guni* in Malaysia and Singapore share similar anxieties over their long term financial security. Without pensions and because in general, they do not make regular contributions to compulsory comprehensive savings schemes, *karung guni* are working beyond the official retirement age in an effort to ensure they have sufficient revenue to meet their daily needs. Third, *karung guni* in Malaysia and Singapore are both limited in their access to formal financial resources because of their lack of good credit scores. Due to this *karung guni* turn to informal (and possibly illegal) financial resources such as illegal moneylending and pawnbrokers. Fourth, and relatedly, *karung guni* cited the formation of co-operatives as an effective means of accessing formal financial resources, and some have successfully done this, while many others have shown interest in this form of

labour organisation. Fifth, *karung guni* in both countries cited the importance of flexibility in work hours as an important factor in their continued practices as *karung guni*. The flexibility in working hours affords them time to engage in reproductive activities that include looking after their children, their spouses, and their parents. Sixth, the family plays an important role in the strategies of *karung guni*. The family provides additional labour power that supports the primary processing activities of e-waste, and also is a source of financial assistance, in providing *karung guni* with extra money to meet their daily needs. Seventh, and lastly, *karung guni* cited the use of lorries as of paramount importance to their value creation opportunities. The use of lorries is pivotal in enabling *karung guni* to collect more e-waste during each collection round, and *karung guni* are even willing to rent lorries to ensure that they have this technology available to them. Taken together, these three differences and seven similarities highlighted in this chapter demonstrate the common factors and strategies adopted by *karung guni* in ensuring their social reproduction and survival, while stressing the continued importance of the state in structuring the regional e-waste recycling network in Malaysia and Singapore.

Several studies have demonstrated the importance of the informal sector in providing affordable food and housing to workers in the urban economy so as to facilitate the continued exploitation of workers by capitalist firms (McFarlane 2012). I have sought to add to this body of work by exploring a different articulation of the informal sector through the supply of a means of production (i.e. primary processed e-waste). Following from Raworth and Kidder (2009, p.165) who argue that "global value chain analysis often takes the firm as its most micro

unit of analysis. For anyone interested in poverty reduction, this is a strange place to stop". In this chapter, I have sought to look at the articulations of informal labour through an interrogation of *karung guni*. In addition, this chapter has sought to address the relative lacuna in GVC/GPN studies on the role of the informal sector towards structuring global production. As demonstrated in this analysis of the regional e-waste recycling network in Malaysia and Singapore in this chapter, the informal sector is constitutive of the development and structure of production networks, and their role and significance should be more effectively considered in these approaches. Second, through the lens of petty commodity production, *karung guni* have challenged the conceptualisation of capital and labour as discrete and antagonistic categories in GVC/GPN research. Lastly, this chapter contributes to GVC/GPN research by underscoring the argument that the lives of *karung guni* (and indeed people in the informal sector) are intimately intertwined and articulated with the formal sector in diverse ways. The analysis of the strategies of *karung guni* discussed in this chapter are an indication of the many ways that the informal sector continues to be co-constitutive of the production networks and economic geographies that they are articulated in.

Through an engagement with PCP literature, I have sought to investigate and analyse the significance of self-employed individuals largely in the informal economy and their articulation with global systems of production. Indeed, Middleton (1989) cautions that the study of PCP in one country does not become exemplary of the insertion of PCP in other developing countries, but provides a point of reference that can contribute to a better informed theoretical framework. Indeed, PCP is a category that has to be mediated through particular geographies

and histories and analysed empirically. This chapter has also pointed to the reality of *karung guni* livelihoods, whereby *karung guni* are left with two main options to increase their revenue – organise with other *karung guni* in co-operatives or unions, or raise their individual productivity. This chapter also recognises the limits to the ability of *karung guni* in increasing their power within the regional e-waste recycling network, and consequently their revenue. The geographical dispersal of *karung guni* causes problems for organising. Overall, understanding *karung guni* as petty commodity producers contributes to perspectives on the role of self-employed individuals and their survival strategies in three ways. First, the conceptualisation as petty commodity producers brings attention to the apparent contradictory unity of capital and labour. In this sense, the relations of production between capital and labour cannot be seen as divided between the owners of the means of production on the one hand, and wage labour on the other. Through their ownership of both the means of production (e-waste), and their own labour power, *karung guni* challenge conceptualisations of capital – wage relations in GVC/GPN research. Second, and relatedly, I have argued that in spite of their ownership of the means of production, *karung guni* are more akin to labour because they are disguised wage labour for wholesalers and recycling firms in their collection and primary processing of e-waste. Due to their need to trade and articulate with the formal sector both in the initial purchase of 'raw' e-waste, and in the subsequent sale of primary processed e-waste, *karung guni* are exploited by economic actors in the formal sector. Third, this chapter's analysis of *karung guni* as petty commodity producers has shed light on the various strategies adopted by them to ensure social reproduction and daily survival. In this way, the strategies discussed here contribute to the body of literature that analyses the everyday economic practices

of economically marginalised groups who are driven by the need to ensure their own (and their family's) continued sustenance, subsistence and survival.

# Chapter 7

## Conclusions

## 7.0 Introduction

In spite of the large body of GCC/GVC/GPN research that has emerged in the past two decades, there remain some under-researched topics, two of which this thesis has identified and analysed: post-consumption and waste; and informal labour. This thesis has demonstrated that elements of the GVC and GPN approaches can be employed in tandem in a research project to answer different research questions and to illuminate different issues of theoretical and empirical concern. In particular, the versatility of GVC/GPN analysis has permitted a shift away from the normal entry points of analysis – production; and firms – towards one that is better suited for the purposes of this research project which focuses on post-consumption; and labour as the starting points for investigation.

In this thesis, value has been employed as the central concept of analysis. First, Marx's (1956; 1990) conceptual lens of value has been employed to examine latent use value in e-waste that forms the basis for further rounds of production (sections 5.1 and 5.2). In this sense, waste is not in diametric opposition to value. Rather, waste embodies value and serves as the beginning point for the reintroduction of e-waste in subsequent production processes. Second, a focus on value has been instrumental in shedding light on the importance of the labour process to value creation (sections 5.1 and 5.3; see also Figure 5.1). Third, an analysis of value in production networks has enabled an examination of the strategies employed by firms and *karung guni* aimed at improving their value creation, enhancement and

capture potentials (sections 5.5 and 6.3). In this way, the focus on value has shed light on various strategies and practices surrounding value creation, enhancement and capture within production networks that are motivated by capital accumulation (by firms), and social reproduction and survival (by *karung guni*). To this end, the conceptual lens of value is the central dynamic that integrates this thesis together.

I have shed light on two objects of inquiry. The first of these two objects – e-waste – has been discussed as the starting point for a new round of value creation. This new round of creation is however, impossible without the labour(s) of the second object of inquiry: the informal sector, in particular *karung guni*. I have highlighted the constitutive role of *karung guni* in the revalorisation of e-waste, and have demonstrated the processes of value creation, enhancement and capture in the regional e-waste recycling network in Malaysia and Singapore. In this chapter, I draw together the main themes and findings of this thesis, and discuss their significance toward understanding the organisation of global production. In section 7.1, I present the arguments made in this thesis with regard to issues of post-consumption and waste, and recapitulate the findings of my thesis. I then assess the significance of these findings in light of GVC/GPN analysis. In section 7.2, I revisit the arguments and findings of this thesis with regard to informal labour, focussing in particular on *karung guni*. In section 7.3, I analyse the significance of the state as a key actor influencing the development and structure of the regional e-waste recycling network in Malaysia and Singapore, and draw out their similarities and differences in the management of e-waste. In section 7.4, I reflect on the significance of the multi-sited case study method, and draw out some of the

differences and similarities in strategies employed by *karung guni* and e-waste recycling firms in Malaysia and Singapore. In the final section, I end this thesis by discussing a few avenues for future research related to: (1) the state; (2) issues of post-consumption; and (3) informal labour.

## 7.1 'Waste' and Value

Through a focus on e-waste, this thesis has contributed to debates on the geographies of waste (Moore 2012). Within these debates, waste has been differentiated into matter that needs to be on the one hand managed and controlled, and on the other, can be valuable resource for subsequent rounds of production and value creation. Taken in the second sense, waste is the linchpin that links together two (seemingly) disconnected production networks by bridging the gap between consumption on the one hand, and a new round of production and value creation on the other. Related to the first research question of this thesis on how e-waste is revalorised and (re)introduced into production networks, I have argued that waste embodies latent use value (section 5.2), and this is demonstrated in the thesis through an analysis of the e-waste circuit of capital (Figure 5.1). Rather than analysing the regional e-waste recycling network through an investigation into the movement *per se* of the commodity itself, in Chapter 5, I have adapted Marx's (1956) circuit of capital to focus on the flows of value within the network, and hence illuminated the processes that enable the creation, enhancement and capture of value. These processes include the collection and primary processing of e-waste by *karung guni*, the bulk collection and further

sorting of e-waste by wholesalers, and the extraction of recovered precious metals by e-waste recycling firms.

I have demonstrated two key arguments related to value that is embodied in e-waste. First, through the payment of money to households by *karung guni* which they collect from, there is a validation of the value that *karung guni* perceive in the e-waste that they purchase, in what has been termed "validation through exchange" (Sheppard & Barnes 1990, p.37). All subsequent transactions between economic actors in the regional e-waste recycling network whereby e-waste (at various levels of processing) is traded, similarly demonstrate this validation of value embodied in e-waste. Relatedly, I have argued that the central process that brings this chain into existence is the purchasing of e-waste by *karung guni* from households and small and medium firms. Their validation of value in e-waste is the crucial moment at which what is waste is reconceptualised as a raw material for subsequent rounds of production and value creation. Second, this process of (re)valuation by *karung guni* through their purchase and collection of e-waste, and the subsequent disassembling, dismantling and sorting brings to light the process of value creation. I have argued that *karung guni* are the pivotal actors (through their collection and primary processing of e-waste) that enable the creation, enhancement and capture of value by other downstream actors (section 5.3.2).

This thesis has thus contributed to GVC/GPN research by refocusing the analysis away from its present focus on production – distribution – consumption, and extended the network to consider how processes of post-consumption are also crucial towards understanding the spatial organisation of global production. The

analysis of e-waste and value in this thesis has highlighted the importance of the potentially continuous process of value (re)creation, enhancement and capture in production networks. In so doing, this thesis has shed light on the interlinked relationships between production networks. I have demonstrated that GVC/GPN research, while in its execution has generally focussed on analysing the global production networks of singular commodities, has the potential of illuminating the interconnectedness of global production, where the waste produced in one production network may be used as the raw material for production in another production network.

## 7.2 Informal Labour

*Karung guni* are crucial in the regional e-waste recycling network in Malaysia and Singapore because of the core functions that they perform in terms of the collection and primary processing of e-waste. I have argued that *karung guni* are considered informal labour because they do not have the same legal status as workers who are employed in the formal sector and are as such not protected by labour laws. Related to the second research question of this thesis on the significance of the informal economy in shaping the structure of the e-waste recycling network, I have argued that the informal sector is constitutive of the regional e-waste recycling network, and needs to be considered in the analysis. To this end, my examination of the relationships of *karung guni* with the regional e-waste recycling network has demonstrated that the informal sector is articulated with this production network as a key source of 'raw material' and disguised wage

labour. Through their value creating activities, and their central role in creating the potential and possibilities for others in the network to create, enhance and capture value, I have demonstrated that *karung guni* are constitutive of the regional e-waste recycling network.

The examination of *karung guni* has also revealed the importance of considering the labour process in the analysis of global production. With reference to Figure 5.1, I have argued that surplus value in this network is produced through the labour process as demonstrated for example by the concrete labour of *karung guni* who collect, dismantle, disassemble and sort the e-waste. Furthermore, in this thesis I have argued that *karung guni* are best conceptualised as petty commodity producers. As demonstrated in section 6.2, conceptualising *karung guni* as petty commodity producers is significant as this contributes towards understanding the articulations of *karung guni* with the capitalist mode of production. In this sense, petty commodity producers are a *form* of production that are always already articulated with the capitalist *mode* of production, and this conceptualisation offers one avenue to analyse this relationship. In addition, conceptualising *karung guni* as petty commodity producers advances our knowledge of the relationships of capital and labour in the contemporary economy. Conceptualised as petty commodity producers through their ownership of both the means of production (in this case e-waste) and their own labour power, *karung guni* problematise as not so straightforward the separation of capital and labour into discreet categories as normally presented in GVC/GPN approaches. Nonetheless, in this thesis, I have also argued that *karung guni* are more akin to labour, and may be best understood as disguised wage labour (Banaji 1977; Bromley & Gerry 1979; Rainbird 1991; Elson

1999). Through their collection and primary processing of e-waste, *karung guni* act as a form of flexible outsourced labour for wholesalers and recycling firms in Malaysia and Singapore who have no impetus to undertake the activities performed by *karung guni*. Additionally, in the case of e-waste recycling firms, it has been observed that they outsource to *karung guni* the primary processing of e-waste that is sold directly from large firms to e-waste recycling firms, further demonstrating that *karung guni* are best seen as disguised wage labour. Through their participation in the regional e-waste recycling network in Malaysia and Singapore, the argument may be made that *karung guni* are creating precarious livelihoods because they are constantly exploited by the formal sector.

Through an analysis of *karung guni*, I have thus contributed to GVC/GPN research in four ways. First, I have shifted the focus of research towards the constitutive role of informal labour by adopting GVC/GPN frameworks as investigative and methodological tools to interrogate the articulations of *karung guni* with the regional e-waste recycling network in Malaysia and Singapore. By adopting *karung guni* as the starting point of my analysis of this production network, I have contributed to GVC/GPN research by shifting the focus away from its present firm-centric focus (Coe et al. 2008). Second, and relatedly, this thesis has placed informal labour at the centre of the analysis, and has thus contributed to an expansion of the GVC/GPN approaches to consider labour beyond those that work in situ: on farms (Selwyn 2009a; 2009b), and factory settings (Cumbers et al. 2008; Xue & Chan 2013). Third, this thesis has contributed to understandings of the value creation process in GPN research, which at present has focussed largely on the processes of value capture in production networks (e.g. Johns 2006; Murphy &

Schindler 2010). Importantly, the process of value creation is linked to the labour process, which I have argued is the process through which surplus value is created. Fourth, the conceptualisation of *karung guni* as petty commodity producers has challenged the normally presented distinction between capital and labour in GVC/GPN and has thus opened up the field to considering other economic actors who may similarly challenge such 'convenient' categorisations.

## 7.3 The State

The state has emerged as a major actor in enabling opportunities and constraining the abilities of economic actors operating within their sovereign territories to create, enhance and capture value. The state through its regulation (or not) of the international trade in e-waste, has been instrumental in facilitating the development and growth of the e-waste recycling industry within its borders (section 4.3.2). In the case of Malaysia, the Malaysian government, through its definition of what constitutes hazardous waste, and lax regulation of e-waste imports, has in effect enabled Malaysia to become a key node in the global management and transhipment of e-waste. Similarly, in the case of Singapore, because the management of e-waste is not a priority of the government, the regulation of e-waste has been partial at best. Indeed, this lax regulation of e-waste is in line with the Singapore government's goal of positioning Singapore as a key recycling centre for the region (Lundgren 2012), while on paper fulfilling its commitments to the Basel Convention. In terms of the domestic management of e-waste, both the governments of Malaysia and Singapore have enabled the proliferation and continued existence of *karung guni* as collectors and primary

processors of e-waste through their municipal solid waste management policies. In the case of Malaysia, no management system exists that caters to the proper disposal and management of e-waste, thus creating an opportunity for *karung guni* to leverage on their existing practices of itinerant waste buying (Tengku-Hamzah 2011). In a similar way, the situation in Singapore has been geared towards the collection and recycling of plastics, paper, glass and metal cans, as required in the National Recycling Programme (section 4.4.2). In addition, the regulation (or lack thereof) of *karung guni* in Malaysia and Singapore has highlighted the ability of the state to influence and regulate labour market within its borders. This is demonstrated in the case of *karung guni*, whereby their activities are not *beyond* state control, but are overlooked in favour of other 'more urgent issues' as defined by the government. As such, the state in Malaysia and Singapore has been instrumental in creating the opportunities for *karung guni* with regard to e-waste recycling through their (lack of) regulation and provision of e-waste management.

Another key role played by the state has been through the provision of social services and subsidies to *karung guni* and their families (section 6.3.2). The importance of the state may be analysed in two ways. First, the subsidies provided to *karung guni* by the state underscore the state's key role in the reproduction of informal labour. Seen in this sense, rather than being beyond the control of the state, through its system of subsidies, the state is demonstrating that informal labour is within its scope of influence. Second, these subsidies to *karung guni* may be understood as *de facto* subsidies to capital, since through these government subsidies, *karung guni* are less inclined to pressure wholesalers and recycling firms for higher prices for their primary processed e-waste. In this way, the

government is providing firms with a reliable and relatively cheaper supply of (informal) labour. Taken together, this analysis of the subsidies provided by the state to *karung guni* enriches and complicates the debates on the role of the state in GVC/GPN research by uncovering the links among the state, firms and labour.

This thesis has thus contributed to GVC/GPN research that emphasises the continued relevance of the state in the development and structure of production networks (Gellert 2003;Liu & Dicken 2006; Smith 2014). Far from being passive to the demands of capital, and irrelevant in the context of globalization, the state remains a significant actor in creating and constraining opportunities for economic actors to create, enhance and capture value (Dicken 2011).

## 7.4 Multi-Sited Case Study Method

A multi-sited case study method to understand the linkages between the e-waste recycling network in Malaysia and Singapore has been adopted. This method has been useful in highlighting the differences between the strategies of actors in these two intimately linked networks, in particular: *karung guni*; and e-waste recycling firms.

In terms of *karung guni*, this method has shed light on two differences between those in Malaysia and those in Singapore. First, in an effort to increase the amount of e-waste that they collect in an estate, *karung guni* in Singapore employ a strategy of temporary territorial capture. This strategy has the effect of reducing competition (albeit temporarily). In contrast, *karung guni* in Malaysia seek to

establish preferential relationships with small and medium firms to thus gain access to more e-waste. Second, the availability of space for storage of e-waste is a key factor in the strategies of *karung guni* in Malaysia and Singapore. In Malaysia, *karung guni* were more actively able to store primary processed e-waste, and thus accumulate sufficient volumes to sell directly to recycling firms, thereby bypassing the wholesalers. In this way, they were able to increase their value capture. In contrast, *karung guni* in Singapore operated within much more restricted spaces, and were thus unable to accumulate sufficient primary processed e-waste to sell directly to recycling firms. Nonetheless, as discussed in section 6.3.8, *karung guni* in Singapore were able to influence the price that was paid for primary processed e-waste when they reduced the supply in response to changes in legislation.

In terms of recycling firms, this thesis uncovered the differences in the strategies adopted in an effort to increase value creation, enhancement and capture. In particular, this thesis uncovered the differences in terms of investments in technology that recycling firms in Malaysia and Singapore were willing to undertake (section 5.5.1). In Malaysia, firms were inclined towards increasing the scale of their processing rather than the scope of their operations, and chose to purchase machinery that improved their core capabilities. In contrast, recycling firms in Singapore invested heavily in technology that helped them increase their productivity and their ability to recover higher proportions of precious metals from e-waste, while expanding the range of services that they were able to offer. The strategies of *karung guni* and e-waste recycling firms summarised here highlight the different goals that they aim to achieve through their strategies. In the case of *karung guni*, their strategies are aimed at ensuring that they have the

sufficient means for social reproduction and survival, while for e-waste recycling firms, their motivation is capital accumulation. In addition, these differences have highlighted the importance of a spatially-attentive conceptualisation of the articulations and strategies of localised actors with global production networks, thus underscoring the significance of geographical difference in creating and constraining opportunities for value creation, enhancement and capture.

Besides the differences, the multi-sited case study method has allowed for an understanding of the similarities between actors. Among *karung guni* in both Malaysia and Singapore, their reliance on the state for subsidies was a common strategy to meet their unpredictable levels of revenue. In addition, *karung guni* relied on their kin and family members to assist in the primary processing of e-waste and for financial support. Similarly, *karung guni* in both cases were heavily reliant on lorries to increase their value creation potential during their collection rounds, and *karung guni* in both countries engaged in practices of illegal moneylending and use of pawnbroker services.

The multi-sited case study method illuminated similarities between the strategies of e-waste recycling firms in Malaysia and Singapore. With regard to international certification, firms in both countries saw this strategy as an effective means to increase access to markets, and to increase their customer base. The other similarity between the recycling firms was in their externalisation of risks related to the collection and primary processing of e-waste to *karung guni*. These similarities highlight on the one hand the capturing of value from informal labour in both these locations by wholesalers and recycling firms, and on the other, the

continued struggles of *karung guni* to ensure social reproduction and survival, most distinctly through their recourse to kin and family for support.

Taken together, the multi-sited case study method has been instrumental in allowing for comparisons (where applicable) to be drawn across the two empirical cases. Importantly, the method adopted in this thesis contributes to discussion on "'how to do' GVC research" (Neilson & Pritchard 2009, p.57) and demonstrates that GVC/GPN analysis can draw significant benefits from engaging in multi-sited case studies.

In the preceding four sections, I have drawn together the key findings and contributions of this thesis. The four themes of: 'waste' and value; informal labour; institutions; and multi-sited case study method are directed at addressing the research questions set out in section 2.3. In the following section, I reflect on some future opportunities for GVC/GPN research, and conclude this thesis on an optimistic note as to the future of GVC/GPN analysis.

## 7.5 Future Research Opportunities

In this section, I explore briefly three future opportunities that I have identified in relation to this thesis, and discuss their significance to GVC/GPN research. The first future opportunity for GVC/GPN research is related to the continued relevance and significance of the state to the development and structure of GVCs/GPNs. Echoing Bair (2005, p.168) who identified institutions and what she termed "regulatory mechanisms" as an important agenda for GVC research, there is potential for

expanded studies of the constitutive role of the state in understanding e-waste production networks. In a similar way to Bair (2005), Smith (2014, p.1) exhorted scholars to undertake a "more adequate theorization of the state and institutional frameworks in work on global production networks and global value chains". In terms of the role of the state in the regional e-waste recycling network in Malaysia and Singapore, one of the issues raised in this thesis has been the positioning of Singapore as a regional recycling hub by the Singapore government. To this end, the Singapore government has engaged in what has been termed "locational tournaments" (Dicken 1990; Dicken & Tickell 1992; Ramasamy & Yeung 2002; Dawley 2007) to attract investment into the recycling industries in Singapore. Research in this direction may include an examination of how the Singapore government formulates policies and strategies to attract investment into its waste management and recycling industries. Relatedly, how does this aggressive push by the Singapore government contribute towards theorisations of the state and its role in chain governance? At a regional level, the establishment of the ASEAN Economic Community to facilitate intra-regional trade may provide fertile ground for further research into the role of the state in production networks, and provide an effective platform for comparison with other regional trading blocs such as MERCOSUR, NAFTA and SAFTA.

Second, post-consumption remains an area in GVC/GPN research that requires further conceptualisation and empirical studies. The international trade of waste and the associated politics of waste management remain significant issues, made more important by the rapid increase in population in countries across the 'developing' world (Crang 2010; Gregson & Crang 2010; Gregson et al. 2010;

Norris 2010; Brooks 2011; Brooks 2013; Crang et al. 2013; Gregson et al. 2013). One research concern that may be suggested from this thesis is related to mapping the geographies of resource recovery. On a related note, how can researchers continue to conceptualise the category of waste in production networks, and its attendant processes and politics of recycling and reuse? In contrast to the processes of recycling discussed in this thesis, where e-waste was broken down to its component parts and subsequently processed to extract the most valuable elements, how may an investigation into practices of upcycling differ in terms of the development and structure of the production network?[31] Also, given the highly toxic nature of e-waste, further investigation into the e-waste recycling production network may connect with issues surrounding environmental pollution to highlight the environmental impacts that processes related to e-waste recycling may have on these locations. In this sense, GVC/GPN research may contribute towards understanding the ways in which production networks impact the natural environment (Coe et al. 2008). As already observed in the case of Guiyu, China, the environmental damage that it has been subjected to is directly linked to its articulation in the global e-waste recycling network (Zhang 2009). In a similar way to understanding how extractive industries impact the surrounding natural environment (Bridge 2008), GVC/GPN analysis may aid in understanding the ways in which patterns of global waste management impact the natural environments where they are located.

[31] Upcycling is different from downcycling in terms of the process of recycling results in material that is used in the manufacture of new products or materials of better quality (Steinhilper & Heiber 2001; Braungart & McDonough 2002; Pol 2010; Mo et al. 2013).

The third research opportunity that this thesis opens up is a further examination of the articulations of informal labour as constitutive actors in GVC/GPN research (Phillips 2011). I have investigated *karung guni* who engage in the recycling of e-waste. However, how may informal labour (or indeed *karung guni*) who recycle other materials be articulated in their respective production networks? A comparative analysis between the articulations of e-waste *karung guni* and paper *karung guni* in Singapore or Malaysia may be fruitful in illuminating different articulations and strategies for social reproduction and survival because of the differences in the organisation of the production network. Relatedly, the strategies discussed in this thesis are not exhaustive of those employed by informal labour to ensure their social reproduction and survival. What other strategies are used by informal labour? And how do these strategies impact on the development and structure of the production networks? With regard to the strategies of *karung guni* in this thesis, the role of the home-space as a dual place for work and social reproduction was discussed as a potential source of conflict and cooperation and shed light on the home as a space where the processes of value creation, enhancement and capture took place. Related to this, how may we conceptualise home-spaces and their articulations in production networks (Kelly 2009), where home-spaces are simultaneously places of productive and reproductive work?

GVC/GPN analysis remains an effective investigative and methodological tool in understanding the spatial organisation of global production by highlighting a variety of actors and geographical scales, and considering seriously the ability of each actor to influence the network to meet its individual goals. The future remains promising for research into global value chains and global production

networks and presents many opportunities for GVC/GPN researchers because of its open and dynamic approach to understanding processes of economic globalization. In conclusion, this thesis has contributed to GVC/GPN research in five ways. First, by examining the processes of post-consumption and waste, I have contributed to GVC/GPN debates by shifting emphasis away from the general emphasis on production and consumption. Relatedly, this thesis has shed light on the process of value (re)creation, and argued that the labour process is key to the creation, enhancement and capture of value. Second, I have highlighted that informal labour is constitutive of production networks, and must be recognised as economic actors that are pivotal to the creation, enhancement and capture of value. Third, through a conceptualisation of *karung guni* as petty commodity producers, I have problematised the normally accepted separation of capital and labour in GVC/GPN research. Fourth, I have shed light on the continued importance of the state in the development and structure of production networks through their social and economic policies, hence echoing the arguments made by other scholars about the continued relevance of the state in influencing the spatial organisation of global production. Fifth, through a multi-sited case study method, this thesis has contributed towards discussions on how to carry out GVC research, and demonstrated that a comparative study method is beneficial in exposing the similarities and differences in the articulation of actors in different geographical locations within production networks.

# Appendices

## Appendix 1: Master Table of Interviewees

## Details of Interviews Conducted in Malaysia

**Government Officials in Malaysia (GvtMys)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Senior Federal Government Official | December 2011 |
| #2 | Senior Federal Government Official | December 2011 |
| #3 | Senior Civil Servant | December 2011 |
| #4 | Senior Civil Servant | December 2011 |

***Karung Guni* in Kuala Lumpur (KGKul)**

| Code Number | Age | Years as *Karung Guni* | Marital Status | Date Interviewed |
|---|---|---|---|---|
| #1 | 50 | 16-20 | Single | September 2011 |
| #2 | 56 | 21-25 | Married | September 2011 |
| #3 | 45 | 16-20 | Married | September 2011 |
| #4 | 47 | 21-25 | Married | September 2011 |
| #5 | 36 | 11-15 | Single | September 2011 |
| #6 | 65 | 26-30 | Married | September 2011 |
| #7 | 34 | 11-15 | Married | September 2011 |
| #8 | 40 | 6-10 | Married | September 2011 |
| #9 | 43 | 6-10 | Married | September 2011 |
| #10 | 55 | 21-25 | Married | December 2011 |
| #11 | 60 | 16-20 | Single | December 2011 |
| #12 | 55 | 21-25 | Married | December 2011 |
| #13 | 37 | 11-15 | Married | December 2011 |
| #14 | 40 | 6-10 | Married | December 2011 |
| #15 | 46 | 6-10 | Married | December 2011 |
| #16 | 63 | 21-25 | Married | December 2011 |
| #17 | 43 | 11-15 | Single | December 2011 |
| #18 | 57 | 16-20 | Married | December 2011 |
| #19 | 62 | 26-30 | Married | December 2011 |
| #20 | 61 | 21-25 | Married | December 2011 |

**Informal E-Waste Wholesaler in Kuala Lumpur (IEWKul)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 6-10 | 4 Employees | September 2011 |
| #2 | 1-5 | 2 Employees | September 2011 |

**Formal E-Waste Wholesaler in Kuala Lumpur (FEWKul)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 6-10 | 8 Employees | September 2011 |
| #2 | 11-15 | 10 Employees | September 2011 |
| #3 | 11-15 | 5 Employees | September 2011 |
| #4 | 6-10 | 4 Employees | September 2011 |

**Government Officials in Kuala Lumpur (GvtKul)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Senior City Government Official | June 2012 |

**Full-Recovery E-Waste Recycling Firm in Kuala Lumpur (FRERKul)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 11-15 | 151-200 | June 2012 |
| #2 | 16-20 | 201-250 | June 2012 |
| #3 | 16-20 | 201-250 | June 2012 |

**Partial-Recovery E-Waste Recycling Firm in Kuala Lumpur (PRERKul)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 6-10 | <50 | June 2012 |
| #2 | 6-10 | <50 | June 2012 |
| #3 | 11-15 | 51-100 | June 2012 |
| #4 | 16-20 | <50 | June 2012 |
| #5 | 11-15 | 51-100 | June 2012 |
| #6 | 16-20 | <50 | June 2012 |

**Municipal Solid Waste Collection Firm in Kuala Lumpur (MSWFKul)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Manager | September 2011 |
| #2 | Senior Manager | September 2011 |

***Karung Guni* in Penang (KGPng)**

| Code Number | Age | Years as *Karung Guni* | Marital Status | Date Interviewed |
|---|---|---|---|---|
| #1 | 36 | 6-10 | Married | October 2011 |
| #2 | 43 | 16-20 | Married | October 2011 |

| | | | | |
|---|---|---|---|---|
| #3 | 47 | 16-20 | Married | October 2011 |
| #4 | 45 | 11-15 | Single | October 2011 |
| #5 | 39 | 6-10 | Married | October 2011 |
| #6 | 52 | 21-25 | Married | October 2011 |
| #7 | 67 | 41-45 | Divorcee | October 2011 |
| #8 | 37 | 11-15 | Married | October 2011 |
| #9 | 44 | 16-20 | Single | January 2012 |
| #10 | 39 | 11-15 | Single | January 2012 |
| #11 | 55 | 21-25 | Married | January 2012 |
| #12 | 36 | 6-10 | Single | January 2012 |
| #13 | 38 | 11-15 | Married | January 2012 |
| #14 | 60 | 21-25 | Single | April 2012 |
| #15 | 39 | 11-15 | Married | April 2012 |
| #16 | 57 | 21-25 | Married | April 2012 |
| #17 | 46 | 16-20 | Single | April 2012 |
| #18 | 37 | 11-15 | Married | April 2012 |
| #19 | 29 | 6-10 | Married | April 2012 |
| #20 | 49 | 16-20 | Married | April 2012 |
| #21 | 47 | 11-15 | Married | April 2012 |

**Informal E-Waste Wholesaler in Penang (IEWPng)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 6-10 | 3 Employees | October 2011 |
| #2 | 6-10 | 2 Employees | October 2011 |
| #3 | 11-15 | 2 Employees | October 2011 |

**Formal E-Waste Wholesaler in Penang (FEWPng)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 6-10 | 4 Employees | October 2011 |
| #2 | 16-20 | 12 Employees | October 2011 |
| #3 | 11-15 | 8 Employees | October 2011 |
| #4 | 16-20 | 6 Employees | October 2011 |
| #5 | 11-15 | 3 Employees | October 2011 |

**Government Officials in Penang (GvtPng)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Senior Civil Servant | January 2012 |
| #2 | Director | January 2012 |
| #3 | Senior State Government Official | January 2012 |
| #4 | Deputy Director | January 2012 |
| #5 | Senior Civil Servant | January 2012 |

| | | |
|---|---|---|
| #6 | Senior City Government Official | June 2012 |
| #7 | Senior City Government Official | June 2012 |

**Full-Recovery E-Waste Recycling Firm in Penang (FRERPng)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 6-10 | 101-150 | June 2012 |
| #2 | 11-15 | 51-100 | June 2012 |
| #3 | 6-10 | 101-150 | June 2012 |
| #4 | 16-20 | 201-250 | June 2012 |
| #5 | 6-10 | 101-150 | June 2012 |
| #6 | 11-15 | 151-200 | June 2012 |

**Partial-Recovery E-Waste Recycling Firm in Penang (PRERPng)**

| Code Number | Number of Years in Operation | Total Manpower | Date Interviewed |
|---|---|---|---|
| #1 | 11-15 | <50 | June 2012 |
| #2 | 6-10 | <50 | June 2012 |
| #3 | 16-20 | 51-100 | June 2012 |
| #4 | 6-10 | <50 | June 2012 |
| #5 | 11-20 | 51-100 | June 2012 |

**Environmental Non-Governmental Organisation in Penang (ENGOPng)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Chairperson | October 2011 |

**Original Brand Manufacturer in Penang (OBMPng)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Chairperson | April 2012 |
| #2 | Director | April 2012 |

**Contract Manufacturer in Penang (CtMfPng)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Director | October 2011 |
| #2 | Deputy Director | January 2012 |
| #3 | Deputy President | April 2012 |

**Municipal Solid Waste Collection Firm in Penang (MSWFPng)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Operations Manager | January 2012 |
| #2 | Deputy Director | January 2012 |

**Small and Medium Enterprise in Penang (SMEPng)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Director | April 2012 |
| #2 | Manager | April 2012 |

## Details of Interviews Conducted In Singapore

**Unlicensed *Karung Guni* in Singapore (UKGSgp)**

| Code Number | Age | Years as *Karung Guni* | Marital Status | Date Conducted |
|---|---|---|---|---|
| #1 | 45 | 11-15 | Married | July 2011 |
| #2 | 55 | 16-20 | Married | July 2011 |
| #3 | 51 | 11-15 | Married | July 2011 |
| #4 | 48 | 11-15 | Single | July 2011 |
| #5 | 39 | 6-10 | Married | July 2011 |
| #6 | 52 | 11-15 | Single | July 2011 |
| #7 | 57 | 11-15 | Married | July 2011 |
| #8 | 42 | 6-10 | Married | August 2011 |
| #9 | 63 | 16-20 | Single | August 2011 |
| #10 | 46 | 11-15 | Married | August 2011 |
| #11 | 43 | 6-10 | Married | August 2011 |
| #12 | 49 | 11-15 | Married | August 2011 |
| #13 | 38 | 6-10 | Single | August 2011 |
| #14 | 48 | 11-15 | Married | August 2011 |
| #15 | 39 | 6-10 | Married | November 2011 |
| #16 | 44 | 6-10 | Married | November 2011 |
| #17 | 42 | 6-10 | Married | November 2011 |
| #18 | 63 | 31-35 | Married | November 2011 |
| #19 | 45 | 11-15 | Single | November 2011 |
| #20 | 41 | 11-15 | Married | November 2011 |
| #21 | 40 | 11-15 | Married | November 2011 |
| #22 | 49 | 16-20 | Single | May 2012 |
| #23 | 49 | 11-15 | Married | May 2012 |
| #24 | 40 | 6-10 | Single | May 2012 |
| #25 | 39 | 11-15 | Single | May 2012 |
| #26 | 47 | 6-10 | Married | May 2012 |
| #27 | 36 | 11-15 | Married | May 2012 |
| #28 | 37 | 11-15 | Married | May 2012 |
| #29 | 45 | 11-15 | Single | May 2012 |
| #30 | 56 | 6-10 | Married | May 2012 |

| | | | | |
|---|---|---|---|---|
| #31 | 60 | 21-25 | Single | May 2012 |
| #32 | 64 | 16-20 | Married | May 2012 |
| #33 | 67 | 31-35 | Married | June 2012 |
| #34 | 57 | 16-20 | Single | June 2012 |
| #35 | 58 | 11-15 | Married | June 2012 |
| #36 | 50 | 16-20 | Married | June 2012 |
| #37 | 58 | 6-10 | Married | June 2012 |
| #38 | 55 | 11-15 | Married | June 2012 |
| #39 | 60 | 16-20 | Married | June 2012 |
| #40 | 52 | 11-15 | Married | June 2012 |

**Licensed *Karung Guni* in Singapore (LKGSgp)**

| Code Number | Age | Years as *Karung Guni* | Marital Status | Date Conducted |
|---|---|---|---|---|
| #1 | 47 | 11-15 | Single | July 2011 |
| #2 | 59 | 16-20 | Married | July 2011 |
| #3 | 49 | 6-10 | Married | July 2011 |
| #4 | 52 | 16-20 | Single | August 2011 |
| #5 | 49 | 6-10 | Married | August 2011 |
| #6 | 58 | 16-20 | Married | August 2011 |

**Informal E-Waste Wholesaler in Singapore (IEWSgp)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 11-15 | 3 Employees | July 2011 |
| #2 | 16-20 | 6 Employees | August 2011 |
| #3 | 11-15 | 2 Employees | August 2011 |
| #4 | 11-15 | 1 Employee | November 2011 |
| #5 | 16-20 | 4 Employees | November 2011 |

**Formal E-Waste Wholesaler in Singapore (FEWSgp)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 16-20 | 12 Employees | July 2011 |
| #2 | 6-10 | 6 Employees | July 2011 |
| #3 | 6-10 | 3 Employees | August 2011 |
| #4 | 6-10 | 4 Employees | August 2011 |
| #5 | 11-15 | 2 Employees | August 2011 |
| #6 | 16-20 | 11 Employees | July 2012 |

**Government Officials in Singapore (GvtSgp)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Senior Civil Servant | November 2011 |
| #2 | Senior Government Official | November 2011 |
| #3 | Senior Civil Servant | November 2011 |
| #4 | Senior Civil Servant | November 2011 |
| #5 | Director | July 2012 |
| #6 | Senior Civil Servant | July 2012 |
| #7 | Senior Management Officer | July 2012 |

**Full-Recovery E-Waste Recycling Firm in Singapore (FRERSgp)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 11-15 | 101-150 | August 2011 |
| #2 | 21-25 | 201-250 | November 2011 |
| #3 | 11-15 | 151-200 | November 2011 |
| #4 | 16-20 | 201-250 | November 2011 |
| #5 | 6-10 | 151-200 | June 2012 |
| #6 | 16-20 | 101-150 | July 2012 |
| #7 | 11-15 | 151-200 | July 2012 |
| #8 | 6-10 | 101-150 | July 2012 |

**Partial-Recovery E-Waste Recycling Firm in Singapore (PRERSgp)**

| Code Number | Number of Years in Operation | Total Number of Employees | Date Interviewed |
|---|---|---|---|
| #1 | 6-10 | <50 | August 2011 |
| #2 | 11-15 | 51-100 | August 2011 |
| #3 | 6-10 | <50 | November 2011 |
| #4 | 11-15 | <50 | November 2011 |
| #5 | 16-20 | 51-100 | July 2012 |
| #6 | 16-20 | 51-100 | July 2012 |

**Original Brand Manufacturer in Singapore (OBMSgp)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | President | December 2012 |
| #2 | Managing Director | December 2012 |
| #3 | Deputy President | December 2012 |
| #4 | Chairperson | December 2012 |

**Contract Manufacturer in Singapore (CtMfSgp)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Chairperson | August 2011 |
| #2 | Vice President | November 2011 |
| #3 | Director | July 2012 |

**Municipal Solid Waste Collection and Recycling Firm in Singapore (MSWFSgp)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Director | July 2011 |
| #2 | Director | July 2011 |
| #3 | Managing Director | August 2011 |
| #4 | Operations Manager | November 2011 |

**Small and Medium Enterprise in Singapore (SMESgp)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Senior Manager | February 2012 |
| #2 | Manager | February 2012 |
| #3 | Assistant Director | July 2012 |
| #4 | Manager | July 2012 |

**Town Council Waste Collector in Singapore (TCWCSgp)**

| Code Number | Appointment | Date Interviewed |
|---|---|---|
| #1 | Supervisor | July 2011 |
| #2 | Supervisor | July 2011 |

**Public Housing Resident in Singapore (PHResSgp)**

| Code Number | Gender | Date Interviewed |
|---|---|---|
| #1 | Female | July 2011 |
| #2 | Male | May 2012 |

**Electrical and Electronic Repair Shop Owner in Singapore (EERpSgp)**

| Code Number | Gender | Date Interviewed |
|---|---|---|
| #1 | Male | February 2012 |
| #2 | Male | February 2012 |
| #3 | Male | May 2012 |
| #4 | Male | May 2012 |

## Appendix 2: Interview Schedule

### Interview Sheet for *Karung Guni* and Partial Recovery/Full Recovery E-Waste Recycling Firms

1. Company Profile (E-Waste Recycling Firms Only)

    a. Could you provide some background on your company's operations?

        i. Could you tell me a short history about your company? Or could you tell me a brief history about how you entered into e-waste recycling?
        ii. What are your main operations?
        iii. How long have you been doing this?
        iv. What is your annual revenue?
        v. Are you a registered firm?
        vi. How many people work for your firm?
        vii. What equipment do you use in the management of e-waste in your firm?

    b. What types of services do you provide and what products do you process/produce?

        i. What is the significance of e-'waste' in comparison to other waste products that you process/produce?
        ii. How have the volumes of e-'waste' changed over the past 10 years? Could you briefly describe some of the reasons for these changes?

    c. How many employees do you have? Has the company grown in recent years? If so, by how much and what are the main reasons for the expansion?

2. Personal Background (*Karung Guni* Only)

    a. What is your typical day like?

    b. How long have you been doing this trade?

    c. How did you begin in this trade?

    d. What are the types of e-waste that you collect?

    e. What percentage of your income is gained from being a *karung guni*?

f. How has your income changed over the last 10 years, and why do you think this has happened?

g. How much e-'waste' do you collect on average in a month? (Ask for a general breakdown of the different kinds, i.e. CPUs, laptops, mobile phones, television sets)

3. Primary And Secondary Chain/Network Participation

a. Who do you see as most influential in controlling the e-'waste' industry in Singapore/Malaysia?

i. Why are they important?
ii. What do they do?
iii. Do they exercise influential control over the rest of the firms/individuals/organisations in the e-'waste' industry?
iv. How do they influence other firms/individuals/organisations?

b. What e-'waste' products do you process and trade in?

i. How do you define e-'waste'?
ii. Where do you get the e-'waste' materials from?
iii. How does your firm view these e-'waste' as of value? (if applicable)
iv. How does your firm add value to the e-'waste'? (if applicable)
v. Does your firm have any special relationships or arrangements with any groups or individuals for the procurement of the e-'waste'?
vi. Do you rely on any specific suppliers for your e-'waste'?

c. How do you determine the BUYING price of the e-'waste'? [PAY ATTENTION TO THE IMPORTANCE OF TARRIFF AND TRADE RULES HERE]

i. Are the prices different for different products that are traded (i.e. CRT Monitors vs. mobile phones vs. televisions vs. circuit boards)?
ii. How do you negotiate the price? With whom do you negotiate prices?
iii. What sources of market information do you rely on in your price negotiations?
iv. Is there someone else (individual or organisation or firm) that regulates the price?
v. Is there any way for you to improve the price paid for your products (i.e. through linkages to other companies, oligopolistic behaviour, quality factors, supplying to a diverse market)? Do you engage in any of these strategies?

vi. Are you able to better negotiate prices with some households/firms/*karung guni* more than others? If so, why?

d. Which companies/markets do you supply to? (Differentiate by product type)

i. Who are your main buyers and what do they buy?
ii. What type of firm are they and where are they located?
iii. Do you know what they manufacture and who they sell their products to subsequently?
iv. How long have you been dealing with them for?
v. Have there been any changes in market demand? If so, can you account for these changes?

e. How do you determine the SELLING price of the e-'waste'? [PAY ATTENTION TO THE IMPORTANCE OF TARRIFF AND TRADE RULES HERE]

i. Are the prices different for different products that are traded (i.e. CRT Monitors vs. mobile phones vs. televisions vs. circuit boards)?
ii. How do you negotiate the price? With whom do you negotiate prices?
iii. What sources of market information do you rely on in your price negotiations?
iv. Is there someone else (individual or organisation or firm) that regulates the price?
v. Is there any way for you to improve the price paid for your products (i.e. through linkages to other companies, oligopolistic behaviour, quality factors, supplying to a diverse market)? Do you engage in any of these strategies?

f. Are you able to better negotiate prices with some traders more than others? How do your buyers negotiate price with you?

i. Do you feel at a disadvantage to the buyers in the negotiations over price?
ii. Do you know who the buyers sell off to?
iii. Do you know what products that the buyers you sell to subsequently sell?

4. <u>Territoriality</u>

a. Where are the areas that you collect your e-'waste' from? (Only *Karung Guni*)

i. How often do you go on collection rounds?

ii. How do you know if the area is already served by someone else? If so, what do you do?
iii. How do you secure an area for collection for yourself?
iv. How do you negotiate collection areas with other *karung guni*?
v. How do you compete with other *karung guni*?
vi. Do you have a 'code of conduct' that you follow?
vii. What do you do if you find out someone else has 'entered into your turf'?
viii. Do you have any co-operative arrangements with any commercial recycling firms or *karung guni*?

b. Who are your main competitors in this industry?

i. Do they also service the same areas as you?
ii. How do you increase your profitability?

5. <u>Role of Informal Industry (i.e. *Karung Guni*) (Only for E-Waste Recycling Firms)</u>

a. Does your company receive e-'waste' from *karung guni*?

i. How does our company view *karung guni*?
ii. How long have you purchased e-waste from *karung guni*?
iii. What are your relationships with *karung guni* like? Do you have any *karung guni* that you have long-standing relationships with?
iv. How do you negotiate the price of e-waste with *karung guni*?
v. Do you see yourself in a more powerful position with regard to price formation when negotiating with *karung guni*?
vi. Do you have any volumetric requirements when purchasing e-waste from *karung guni*? If so, what are they?
vii. Do you have any special relationships or arrangements, especially with regard to the e-waste they collect, with any *karung guni* (individuals or groups)?
viii. Are there any regions of Singapore/Malaysia that you see *karung guni* more active at?
ix. Are the *karung guni* considered as competition by your firm? If so, how are they competition to you?
x. How do the *karung guni* affect the activities and performance of your company?

6. <u>Government-Industry Relations (E-Waste Recycling Firms Only)</u>

a. From your company's perspective, what is your opinion on the effectiveness of the waste management regulations in Singapore/Malaysia, particularly those that are relevant to e-waste?

b. The Basel Convention is the leading international convention on e-waste management. Does the Basel Convention affect your company?

    i. What is your company's view of the Basel Convention?
    ii. How does your company abide by the regulations set out in the Basel Convention?
    iii. Do you think the Basel Convention is effective?
    iv. How does the Basel Convention affect or aid the activities of your company?

7. Government – *Karung Guni Relations* (*Karung Guni* Only)

    a. What forms of regulation do you know of with regard to being a *karung guni*?

    b. Have you ever had any experiences with the law that you would like to share?

    c. Do you receive any subsidies? From the government? From welfare organisations? How are these subsidies important to you?

8. General Opinions of the Industry

    a. Looking at the e-'waste' industry as a whole, what do you think plays an important part in shaping its structure and development?

    b. Looking at the e-'waste' industry as a whole, what do you think it will look like in 5-10 years? (i.e. new players? Major changes? New technology?)

    c. What changes can you foresee and could you briefly describe the reasons for these changes?

9. Snowballing, Triangulation, A.O.B.

    a. Who else would you recommend that I speak to? Have you any contacts that would be keen on participating in this research? In Singapore, or Malaysia or further afield?

    b. Based on our discussion, is there any information that you would like to share that might be useful to this study? (E.g. Company reports, Corporate presentations, promotional material, product information, press releases, stock market information)

**Interview Sheet for E-Waste Wholesalers**

1. Company Profile

    a. Could you provide some background on your company's operations?

        i. Could you tell me a short history about your company? Or could you tell me a brief history about how you entered into e-waste wholesale?
        ii. What are your main operations?
        iii. How long have you been doing this for?
        iv. What is your annual revenue?
        v. Are you a registered firm?
        vi. How many people work for your firm?
        vii. What equipment do you use in the management of e-waste in your firm?

    b. What types of services do you provide and what products do you process/produce?

        i. What is the significance of e-waste in comparison to other waste products that you process/produce?
        ii. How do you determine the value of e-waste that you process?
        iii. What is the volume of e-waste that you trade in on an annual basis?
        iv. What is your firm's annual turnover? Has your firm's turnover changed over the past 10 years? Is this related to the price of e-waste and metals? If so, how?
        v. How have the volumes of e-waste changed over the past 10 years? Could you briefly describe some of the reasons for these changes?

    c. How many employees do you have? Has the company grown in recent years? If so, by how much and what are the main reasons for the expansion?

        i. How many staff do you have?
        ii. How many of your staff are full-time? Part-time? Contract employees? Non-contract employees?
        iii. Do you employ any informal labour? If so, how many? How often do you employ informal labour? What functions do informal labour perform?

2. Primary and Secondary Chain/Network Participation

a. Who do you see as most influential in controlling the e-waste industry in Singapore/Malaysia?

    i. Who are the other firm and non-firm actors that you have relationships with?
    ii. Why are they important?
    iii. What do they do?
    iv. Do they exercise influential control over the rest of the firms/individuals/organisations in the e-waste industry?
    v. How do they influence other firms/individuals/organisations?

b. What e-waste products do you process and trade in?

    i. How do you define e-waste?
    ii. Where do you get the e-waste from?
    iii. What does your firm do to the e-waste?
    iv. Does your firm use any machinery or technology to process the e-waste?
    v. How does your firm view the e-waste as of value?
    vi. How does your firm add value to the e-waste?
    vii. Does your firm have any special relationships or arrangements with any groups or individuals for the procurement of the e-waste?
    viii. Do you rely on any specific suppliers for your e-waste?

c. How do you determine the BUYING price of the e-waste? [PAY ATTENTION TO THE IMPORTANCE OF TARRIFF AND TRADE RULES HERE]

    i. Are the prices different for different products that are traded (i.e. CRT Monitors vs. mobile phones vs. televisions vs. circuit boards)?
    ii. How do you negotiate the price? With whom do you negotiate prices?
    iii. Do you see any scope for the negotiation of prices? If so, why? If not, why not?
    iv. How do you determine the price at which you purchase e-waste?
    v. What sources of market information do you rely on in your price negotiations?
    vi. Is there someone else (individual or organisation or firm) that regulates the price?
    vii. Is there any way for you to improve the price paid for your products (i.e. through linkages to other companies, oligopolistic behaviour, quality factors, supplying to a diverse market)? Do you engage in any of these strategies?
    viii. Are you able to better negotiate prices with some traders more than others? If so, why are you able to? If not, why not?

d. Which companies/markets do you supply to? (Differentiate by product type)

    i. Who are your main buyers and what do they buy?
    ii. What type of firm are they and where are they located? Do you know why they are located there?
    iii. Is there any location where these buyers are generally located?
    iv. What is the geography of the market for e-waste? Why so? Are there concentrations of activities in certain locations? Why is it so?
    v. Do you know what they manufacture and who do they sell their products to subsequently?
    vi. How long have you been dealing with them for?
    vii. Have there been any changes in market demand? If so, can you account for these changes?

e. How do you determine the SELLING price of the e-waste? [PAY ATTENTION TO THE IMPORTANCE OF TARRIFF AND TRADE RULES HERE]

    i. Are the prices different for different products that are traded (i.e. CRT Monitors vs. mobile phones vs. televisions vs. circuit boards)?
    ii. How do you negotiate the price? With whom do you negotiate prices?
    iii. Do you see any scope for the negotiation of prices? If so, why? If not, why not?
    iv. How do you determine the price at which you sell e-waste?
    v. What sources of market information do you rely on in your price negotiations?
    vi. Is there someone else (individual or organisation or firm) that regulates the price?
    vii. Is there any way for you to improve the price paid for your products (i.e. through linkages to other companies, oligopolistic behaviour, quality factors, supplying to a diverse market)? Do you engage in any of these strategies?
    viii. Are you able to better negotiate prices with some traders more than others?

f. What services and products do you think major buyers of your products look for in their core suppliers? (Differentiate buyers by country of origin, sector [i.e. plastics, precious metals, etc.])

    i. What is the most important factor in buyer's consideration of core suppliers? (e.g. ISO Standards, Basel Convention regulation, reliability, CSR practices)?

ii. What are the technical specifications that the buyers ask of you?
iii. What demands do they place upon you for the purchase of e-waste from you?

g. How do your buyers negotiate price with you?

i. Do you feel at a disadvantage to the buyers in the negotiations over price?
ii. Do you know who the buyers sell on to?
iii. Do you know what products that the buyers you sell to subsequently sell?

3. Government-Industry Relations

a. From your company's perspective, what is your opinion on the effectiveness of the waste management regulations in Singapore/Malaysia, particularly those that are relevant to e-waste?

b. The Basel Convention is the leading international convention on e-waste management. Does the Basel Convention affect your company?
i. What is your company's view of the Basel Convention?
ii. How does your company abide by the regulations set out in the Basel Convention?
iii. Do you think the Basel Convention is effective?
iv. How does the Basel Convention affect or aid the activities of your company?

4. Role of Informal Industry (i.e. *Karung Guni*)

a. Does your company receive e-waste from *karung guni*?
i. How does our company view *karung guni*?
ii. How long have you purchased e-waste from *karung guni*?
iii. What are your relationships with *karung guni* like? Do you have any *karung guni* that you have long-standing relationships with?
iv. How do you negotiate the price of e-waste with *karung guni*?
v. Do you see yourself in a more powerful position with regard to price formation when negotiating with *karung guni*?
vi. Do you have any volumetric requirements when purchasing e-waste from *karung guni*? If so, what are they?
vii. Do you have any special relationships or arrangements, especially with regard to the e-waste they collect, with any *karung guni* (individuals or groups)?
viii. Are there any regions of Singapore/Malaysia that you see *karung guni* more active at?

ix. Are the *karung guni* considered as competition by your firm? If so, how are they competition to you?
x. How do the *karung guni* affect the activities and performance of your company?

5. <u>General Opinions of the Industry</u>

    a. Looking at the e-waste industry as a whole, what do you think plays an important part in shaping the structure of the industry? Are there any actors who have a stronger influence on the shape of the industry?

    b. Looking at the e-waste industry as a whole, what do you think it will look like in 5-10 years? (i.e. new players? Major changes? New technology?)

    c. What changes can you foresee and could you briefly describe the reasons for these changes?

6. <u>Snowballing, Triangulation, A.O.B.</u>

    a. Who else would you recommend that I speak to? Have you any contacts that would be keen on participating in this research? In Singapore, or Malaysia or further afield?

    b. Based on our discussion, is there any information that you would like to share that might be useful to this study? (E.g. Company reports, Corporate presentations, promotional material, product information, press releases, stock market information)

## Interview Sheet for Contract Manufacturers and Original Brand Manufacturers

1. Company Profile

    a. Could you provide some background on your company's operations?

        i. Could you tell me a short history about your company? Or could you tell me a brief history about how you began using recovered precious metals in your production?
        ii. What are your main operations?
        iii. How long have you been doing this for?
        iv. What is your annual revenue?
        v. Are you a registered firm?
        vi. How many people work for your firm?
        vii. What equipment do you use in the management of e-waste in your firm?

    b. What types of services do you provide and what products do you process/produce?

        i. What is the significance of e-'waste' in comparison to other sources of raw materials for your company's production?
        ii. What is the volume of e-waste that you purchase on an annual basis?
        iii. How many employees do you have? Has the company grown in recent years? If so, by how much and what are the main reasons for the expansion? Has your company's reliance on raw materials sourced from recycled e-'waste' changed over the past 10 years?
        iv. What is your firm's annual turnover? Has your firm's turnover changed over the past 10 years? Is this related to the price of e-waste and metals? If so, how?

2. Primary and Secondary Chain/Network Participation

    a. Who do you see as most influential in the e-'waste' industry in Singapore/Malaysia?

        i. Why are they important?
        ii. What do they do?
        iii. Do they exercise influential control over the rest of the firms/individuals/organisations in the e-'waste' industry?
        iv. How do they influence other firms/individuals/organisations?

b. How important are the raw materials from recycled e-'waste' to your production?

    i. What percentage of your raw materials are from recycled e-'waste'?
    ii. Does your firm have any special relationships or arrangements with any groups or individuals for the procurement of the raw materials from recycled e-'waste'?
    iii. Do you rely on any specific suppliers for your raw materials from recycled e-'waste'?

c. How do you determine the BUYING price of the raw materials from recycled e-'waste'? [PAY ATTENTION TO THE IMPORTANCE OF TARRIFF AND TRADE RULES HERE]

    i. How do you negotiate the price? With whom do you negotiate prices?
    ii. What sources of market information do you rely on in your price negotiations?
    iii. Is there someone else (individual or organisation or firm) that regulates the price?
    iv. Is there any way for you to improve the price paid (i.e. through linkages to other companies, oligopolistic behaviour, quality factors, supplying to a diverse market)? Do you engage in any of these strategies?
    v. Are you able to better negotiate prices with some suppliers more than others?
    vi. Do you have any specifications as to the condition and quality of the materials that you buy from the suppliers?

d. Which companies/markets do you supply to? (Differentiate by product type)

    i. Who are your main buyers of your products and what do they buy?
    ii. What types of firms are they and where are they located?
    iii. Do you know what they manufacture and who do they sell their products to subsequently?
    iv. How long have you been dealing with them for?
    v. Have there been any changes in market demand? If so, can you account for these changes?

e. What services and products does your company look for in your core suppliers? (Differentiate suppliers by country of origin, sector [i.e. plastics, precious metals, etc.])

    i. What is the most important factor in your company's consideration of core suppliers? (e.g. ISO Standards, Basel Convention regulation, reliability, CSR practices)?

ii. What are the technical specifications that your company asks of suppliers?
iii. What demands does your company place upon suppliers for the sale? (i.e. condition of materials, quality, quantity)

3. Government-Industry Relations

a. From your company's perspective, what is your opinion on the effectiveness of the waste management regulations in Singapore/Malaysia, particularly those that are relevant to e-'waste'?

b. The Basel Convention is the leading international convention on e-'waste' management. Does the Basel Convention affect your company?

i. What is your company's view of the Basel Convention?
ii. How does your company abide by the regulations set out in the Basel Convention?
iii. Do you think the Basel Convention is effective?
iv. How does the Basel Convention affect or aid the activities of your company?

4. General Opinions of the Industry

a. Looking at the e-'waste' industry as a whole, what do you think plays an important part in shaping the development and structure of the industry?

b. Looking at the e-'waste' industry as a whole, what do you think it will look like in 5-10 years? (i.e. new players? Major changes? New technology?)

c. What changes can you foresee and could you briefly describe the reasons for these changes?

5. Snowballing, Triangulation, A.O.B.

a. Who else would you recommend that I speak to? Have you any contacts that would be keen on participating in this research? In Singapore, or Malaysia or further afield?

b. Based on our discussion, is there any information that you would like to share that might be useful to this study? (E.g. Company reports, Corporate presentations, promotional material, product information, press releases, stock market information)

## Interview Sheet for Government Officials

1. Background of the E-Waste Industry

    a. Could you please give a brief outline of Malaysia's/Singapore's waste sector? With a specific focus on electronic and electrical waste please?

        i. How much e-waste is disposed in Malaysia/Singapore on an annual basis?
        ii. How much of this e-waste is incinerated?
        iii. How much of this e-waste is sent on to other countries for recycling?
        iv. How much e-waste does Singapore receive?

    b. What do you see as the most important impact of the emergence of the e-waste recycling industries in Malaysia/Singapore?

    c. What do you see as the economic significance of the e-waste recycling industry to Malaysia/Singapore? What do you see as the environmental significance of the e-waste recycling industry in Malaysia/Singapore?

    d. Do you see any benefits/detriments to having e-waste recycling facilities in Malaysia/Singapore?

2. Chain Participation

    a. Who do you see as most influential in controlling the e-'waste' industry in Malaysia/Singapore?

        i. Why are they important?
        ii. What do they do?
        iii. Do they exercise influential control over the rest of the firms/individuals/organisations in the e-'waste' industry?
        iv. How do they influence other firms/individuals/organisations?

    b. What do you see as the role of the government in the e-waste recycling industry in Malaysia/Singapore?

        i. How does the government regulate the e-waste recycling industry in Malaysia/Singapore?
        ii. Do you have any auditing/monitoring system to regulate the e-waste recycling industry in Malaysia/Singapore?

iii. Does the government provide any subsidies or concessions to e-waste recycling firms?

c. Do you know if Malaysia/Singapore exports any of its e-waste, and if so, where does it send it to?

i. Do you know which firms Malaysia/Singapore exports to?
ii. Do you know what volumes are exported?
iii. Do you know who is exporting this e-waste?
iv. Do you know at what price the e-waste is exported?

d. Do you know if Malaysia/Singapore imports any of its e-waste, and if so, where does it receive it from?

i. Do you know which firms Malaysia/Singapore imports from?
ii. Do you know what volumes are imported?
iii. Do you know who is importing this e-waste?
iv. Do you know at what price the e-waste is imported?

3. <u>Government-Industry Relations</u>

a. What strategies has the Malaysia/Singapore government used to attract e-waste processing companies to set up in Malaysia/Singapore? What have you done to encourage them to stay?

b. How cooperative with government procedures, guidelines and concerns are the e-waste recycling firms?

c. From Malaysia/Singapore's perspective, what is your opinion on the effectiveness of the waste management regulations in Malaysia/Singapore, particularly those that are relevant to e-'waste'?

d. The Basel Convention is the leading international convention on e-'waste' management. Does the Basel Convention affect Malaysia/Singapore?

i. What is Malaysia/Singapore's view of the Basel Convention?
ii. How does Malaysia/Singapore abide by the regulations set out in the Basel Convention?
iii. What laws has Malaysia/Singapore passed in relation to the Basel Convention?
iv. Do you think the Basel Convention is effective?
v. How does the Basel Convention affect or aid the activities of businesses in Malaysia/Singapore?

e. What support programmes does your government provide to the e-waste industry to facilitate their operations?

f. Does Malaysia/Singapore have any special arrangements with other countries/states for the import/export of e-waste for the purpose of processing and recycling? For example, tax incentives, customs agreements, tariff arrangements?

4. Regional Trade

    a. Do you have any bilateral or multilateral regional trading links within your subgrouping e.g. ASEAN, APEC that deals with e-waste related trade?

    b. Are you aware of any e-waste materials that are traded within the region?

        i. If so, how has this been achieved?

5. Role of Informal Industry (i.e. *Karung Guni*)

    a. How does your government view the activities carried out by *karung guni*?

    b. Are there any laws which regulate the activities of *karung guni* in Malaysia/Singapore?

        i. Does your government have any laws that protects/endangers the livelihood of the *karung guni*?

        ii. Who enforces these laws?

        iii. Do you know of any cases of *karung guni* being charged in court or fined for the work they do? How many cases do you know of?

    c. Has your government undertaken any programmes or policies to assist *karung guni* in their work?

    d. Does your government view *karung guni* as a group of people here to stay or as a group that will pass away in the near future?

6. General Opinions of the Industry

    a. Looking at the e-'waste' industry as a whole, what do you think plays an important part in shaping the development and structure of the industry?

b. Looking at the e-'waste' industry as a whole, what do you think it will look like in 5-10 years? (i.e. new players? Major changes? New technology?). What strategies does the government have in place to try to enhance the operations of the e-waste industry?

c. What changes can you foresee and could you briefly describe the reasons for these changes?

7. Snowballing, Triangulation, A.O.B.

a. Who else would you recommend that I speak to? Have you any contacts that would be keen on participating in this research? In Singapore, or Malaysia or further afield?

b. Based on our discussion, is there any information that you would like to share that might be useful to this study? (E.g. Company reports, Corporate presentations, promotional material, product information, press releases, stock market information)

## Appendix 3: List of Conferences, Exhibitions, Working Group Discussions and Workshops Attended

| Date | Location | Name of Event |
|---|---|---|
| 1-2 August 2011 | Singapore | Inter-Asia Roundtable 2011 – Recycling Cities (Organised by Asia Research Institute, National University of Singapore) |
| 19 October 2011 | Penang | Visit to Small Recyclers in Penang Island (Organised by Penang E-Waste Project) |
| 24 October 2011 | Penang | Penang E-Waste Project Kickoff Seminar Workshop (Organised by Penang E-Waste Project) |
| 17 Jan 2012 | Penang | Penang E-Waste Project Idea Sharing Workshop (Organised by Penang E-Waste Project) |
| 9-14 February 2012 | Singapore | Waste Management Seminar (Organised by National Environment Agency, Singapore & Waste Management and Recycling Association of Singapore) |
| 23 March 2012 | Penang | Local Working Group Meeting on Pilot Project Design (Organised by Penang E-Waste Project) |
| 26 March 2012 | Kuala Lumpur | Official Consultative Meeting between Penang E-Waste Project and EEE Manufacturers (Organised by Penang E-Waste Project) |
| 30 March 2012 | Singapore | Industry Forum – Opportunities in Kitakyushu (Japan) and R3C's Capabilities on Waste Management (Organised by Waste Management and Recycling Association of Singapore & Nanyang Technological University, Singapore) |
| 4 April 2012 | Singapore | Sharing Session with SMEs (Organised by Waste Management and Recycling Association of Singapore) |
| 24-26 April 2012 | Singapore | Hazardous Waste Seminar and Workshop (Organised by International Solid Waste Association) |
| 1 June 2012 | Penang | Penang E-Waste Project Pilot Project Launching Workshop (Organised by Penang E-Waste Project) |
| 1-4 July 2012 | Singapore | WasteMet Asia 2012 – Asia's International Waste Management and Environmental Technology Exhibition |
| 3-4 July 2012 | Singapore | Beacon Conference on Globalisation, Urban Metabolism and Waste Management (Organised by International Solid Waste Association) |

## Appendix 4: Annex I and Annex III of Basel Convention on the Transboundary Movement of Hazardous Waste

## Annex I of the Basel Convention (Categories of Wastes to be Controlled)

| **Waste Streams** | |
|---|---|
| **Y1** | Clinical wastes from medical care in hospitals, medical centres and clinics. |
| **Y2** | Wastes from the production and preparation of pharmaceutical products. |
| **Y3** | Waste pharmaceuticals, drugs and medicines. |
| **Y4** | Wastes from the production, formulation and use of biocides and phyto-pharmaceuticals. |
| **Y5** | Wastes from the manufacture, formulation and use of wood preserving chemicals. |
| **Y6** | Wastes from the production, formulation and use of organic solvents. |
| **Y7** | Wastes from heat treatment and tempering operations containing cyanides. |
| **Y8** | Waste mineral oils unfit for their originally intended use. |
| **Y9** | Waste oils/water, hydrocarbons/water mixtures, emulsions. |
| **Y10** | Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs). |
| **Y11** | Waste tarry residues arising from refining, distillation and any pyrolytic treatment. |
| **Y12** | Wastes from production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish. |
| **Y13** | Wastes from production, formulation and use of resins, latex, platicisers, glues/adhesives. |
| **Y14** | Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on man and/or the environment are not known. |
| **Y15** | Waste of an explosive nature not subject to other legislation. |
| **Y16** | Wastes from production, formulation and use of photographic chemicals and processing materials. |
| **Y17** | Wastes resulting from surface treatment of metals and plastics. |
| **Y18** | Residues arising from industrial waste disposal operations. |
| | |
| **Wastes having as constituents:** | |
| **Y19** | Metal cabonyls. |
| **Y20** | Beryllium; beryllium compounds. |
| **Y21** | Hexavalent chromium compounds. |
| **Y22** | Copper compounds. |
| **Y23** | Zinc compounds. |
| **Y24** | Arsenic; arsenic compounds. |
| **Y25** | Selenium; selenium compounds. |
| **Y26** | Cadmium; cadmium compounds. |
| **Y27** | Antimony; antimony compounds. |
| **Y28** | Tellurium; tellurium compounds. |
| **Y29** | Mercury; mercury compounds. |
| **Y30** | Thallium; thallium compounds. |
| **Y31** | Lead; lead compounds. |
| **Y32** | Inorganic fluorine compounds excluding calcium fluoride. |

| | |
|---|---|
| **Y33** | Inorganic cyanides. |
| **Y34** | Acidic solutions or acids in solid form. |
| **Y35** | Basic solutions or bases in solid form. |
| **Y36** | Asbestos (dust and fibres). |
| **Y37** | Organic phosphorous compounds. |
| **Y38** | Organic cyanides. |
| **Y39** | Phenols; phenol compounds including chlorophenols. |
| **Y40** | Ethers. |
| **Y41** | Halogenated organic solvents. |
| **Y42** | Organic solvents excluding halogenated solvents. |
| **Y43** | Any congenor of polychlorinated dibenzo-furan. |
| **Y44** | Any congenor of polychlorinated dibenzo-p-dioxin. |
| **Y45** | Organohalogen compounds other than substances referred to in this Annex (e.g. Y39, Y41, Y42, Y43,Y44). |

Source: Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Available at: www.basel.int [Accessed: January 20, 2011].

## Annex III of the Basel Convention (List of Hazardous Characteristics)

| UN Class | Code | Characteristics |
|---|---|---|
| 1 | H1 | Explosive<br>An explosive substance or waste is a solid or liquid substance or waste (or mixture of substances or wastes) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. |
| 3 | H3 | Flammable liquids.<br>The word 'flammable' has the same meaning as 'inflammable'.<br>Flammable liquids are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc., but not including substances or wastes otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of no more than 60.5˚C, closed-cup test, or not more than 65.6˚C, open-cup test. (Since the results of open-cup test and of closed-cup tests are not strictly comparable and even individual results of the same test are often variable, regulations varying from the above figures to make allowance for such differences would be within the spirit of this definition). |
| 4.1 | H4.1 | Flammable solids.<br>Solids, or waste solids, other than those classes as explosives, which under conditions encountered in transport are readily combustible, or may cause or contribute to fire through friction. |
| 4.2 | H4.2 | Substances or wastes liable to spontaneous combustion.<br>Substances or wastes, which are liable of spontaneous heating under normal conditions, encountered in transport, or to heating up on contact with air, and being then liable to catch fire. |
| 4.3 | H4.3 | Substances or wastes which, in contact with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities. |
| 5.1 | H5.1 | Oxidizing.<br>Substances or wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, |

| | | |
|---|---|---|
| | | the combustion of other materials. |
| 5.2 | H5.2 | Organic peroxides.<br>Organic substances or wastes which, contain the bivalent-O-O-structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition. |
| 6.1 | H6.1 | Poisonous (Acute).<br>Substances or wastes liable either to case death or serious injury or to harm human health if swallowed or inhaled or by skin contact. |
| 6.2 | H6.2 | Infectious substances.<br>Substances or wastes containing viable micro-organisms or their toxins which are known or suspected to cause disease in animals or humans. |
| 8 | H8 | Corrosives.<br>Substances or wastes which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport; they may also cause other hazards. |
| 9 | H10 | Liberation of toxic gases in contact with air or water.<br>Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities. |
| 9 | H11 | Toxic (delayed or chronic).<br>Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity. |
| 9 | H12 | Ecotoxic.<br>Substances or wastes which if released present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems. |
| 9 | H13 | Capable, by any means, after disposal, of yielding another material, e.g. leachate, which possesses any of the characteristics listed above. |

Source: Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Available at: www.basel.int [Accessed: January 20, 2011].

# Bibliography

Abdih, Y. & Medina, L., 2013. *Measuring the informal economy in the Caucasus and Central Asia*. IMF Working Paper WP/13/137 [Online]. Washington, D.C.: International Monetary Fund. Available at: http://www.imf.org/external/pubs/ft/wp/2013/wp13137.pdf [Accessed March 17, 2014].

Abdul-Majeed, H. & Ismail, S., 2013. Green urbanization: The case of Penang. In S. Yusuf, ed. *Five Cities Going Green: How are they doing it?* Washington, D.C.: The Growth Dialogue, pp. 71–88.

AFP, 2002. Singapore firm recycling electronics waste finds gold in garbage. *Agence France Presse*, August 13, 2002. Available at: http://ban.org/ban_news/singapore_firm.html [Accessed: January 10, 2013].

Alden, J., 1981. Holding two jobs: An examination of "moonlighting." In S. Henry, ed. *Can I Have It In Cash? A Study of Informal Institutions and Unorthodox Ways of Doing Things*. London: Astragal Books, pp. 43–57.

Alexander, C., 2006. Value: Economic valuations and environmental policy. In A.G. Carrier, ed. *A Handbook of Economic Anthropology*. Cheltenhan, UK: Edward Elgar Publishing, pp. 455–471.

Alias, A.-F., Ishak, M.B., Mohammad Zulkifli, S.N.A. & Abdul Jalil, R., 2014. E-waste management: An emerging global crisis and the Malaysian scenario. *International Journal of Environmental Sciences*. 4(4), pp.444-457.

Alter Chen, M., 2006. Rethinking the informal economy: Linkages with the formal economy and the formal regulatory environment. In B. Guha-Khasnobis, R. Kanbur, & E. Ostrom, eds. *Linking the Formal and Informal Economy: Concepts and Policies*. Oxford: Oxford University Press, pp.75-92.

Amin, S. & van der Linden, M. eds., 1997. *"Peripheral" Labour? Studies in the History of Partial Proletarianization*, Cambridge: Cambridge University Press.

Anner, M., 2007. Forging new labor activism in global commodity chains in Latin America. *International Labor and Working-Class History*, 72(1), pp.18–41.

Appadurai, A., 1988. *The Social Life of Things: Commodities in Cultural Perspective*, Cambridge, UK: Cambridge University Press.

Arlosoroff, S. & Rushbrook, P., 1991. Developing countries struggle with waste management policies. *Waste Management & Research*, 9(1), pp.491–494.

ASEAN, 2014. *Association of Southeast Asian Nations Official Website* [Online]. Available at: www.asean.org [Accessed: January 10, 2014].

Asher, M., 1998. The future of retirement protection in Southeast Asia. *International Social Security Review*, 51(1), pp.3–30.

Asim, M., Batool, S.A. & Chaudhry, M.N., 2012. Scavengers and their role in the

recycling of waste in Southwestern Lahore. *Resources, Conservation and Recycling*, 58, pp.152–162.

Assaad, R., 1996. Formalizing the informal? The transformation of Cairo's refuse collection system. *Journal of Planning Education and Research*, 16(2), pp.115–126.

Atkinson, R. & Flint, J., 2004. Snowball sampling. In *The SAGE Encyclopedia of Social Science Research Methods*. Thousand Oaks: SAGE Publications, pp. 1044–1045.

Austria, M.S., 2011. Moving towards an ASEAN economic community. *East Asia*, 29(2), pp.141–156.

Awang, A.R., 2010. E-Waste Management in Malaysia. *Open Workshop Presentation* at *Regional Workshop on WEEE / E-Waste Management in Osaka, Japan, July 6-9, 2010* [Online]. UNEP-DTIE-IETC: Tokyo, Japan. Available at: http://www.unep.or.jp/ietc/spc/news-jul10/Malaysia_(Dr.RahmanAwang).pdf [Accessed: January 17, 2012].

Azmeh, S., 2014. Labour in global production networks: Workers in the qualifying industrial zones (QIZs) of Egypt and Jordan. *Global Networks*. Advance Access. DOI: 10.1111/glob.12047 [Accessed: January 15, 2014].

Babu, B.R., Parande, A.K. & Basha, C.A., 2007. Electrical and electronic waste: A global environmental problem. *Waste Management & Research*, 25(4), pp.307–318.

Backer, K.D. & Miroudot, S., 2013. *Mapping Global Value Chains*. OECD Trade Policy Papers No. 159 [Online]. Paris: OECD Publishing. Available at: http://www.oecd-ilibrary.org/trade/mapping-global-value-chains_5k3v1trgnbr4-en [Accessed: January 12, 2014].

Bair, J., 2005. Global capitalism and commodity chains: Looking back, going forward. *Competition & Change*, 9(2), pp.153–180.

Bair, J., 2006. Regional trade and production blocs in a global industry: Towards a comparative framework for research. *Environment and Planning A*, 38(12), pp.2233–2252.

Bair, J., 2008. Analysing global economic organization: Embedded networks and global chains compared. *Economy and Society*, 37(3), pp.339–364.

Bair, J., 2009. Global commodity chains: Geneology and review. In J. Bair, ed. *Frontiers of Commodity Chain Research*. Stanford, California: Stanford University Press, pp. 1–34.

Bair, J. & Gereffi, G., 2001. Local clusters in global chains: The causes and consequences of export dynamism in Torreon's blue jeans industry. *World Development*, 29(11), pp.1885–1903.

Bair, J. & Gereffi, G., 2003. Upgrading, uneven development, and jobs in the North

American apparel industry. *Global Networks*, 3(2), pp.143–169.

Bair, J. & Peters, E.D., 2006. Global commodity chains and endogenous growth: Export dynamism and development in Mexico and Honduras. *World Development*, 34(2), pp.203–221.

Bair, J. & Ramsay, H., 2003. Global production networks: A commodity chain analysis and its implications for labor. In W. Cooke, ed. *Multinational Companies and Global Human Resource Strategies*. Westport, CT: Quorum Books, pp. 43–64.

Bakhtyar, B., Zaharim, A., Sopian, K. & Moghimi, S., 2013. Housing for poor people: A review on low cost housing process in Malaysia. *WSEAS Transactions on Environment and Development*, 9(2), pp.126–136.

Banaji, J., 1977. Modes of production in a materialist construction of history. *Capital & Class*, 1(3), pp.1-44.

Banaji, J. 2010. *Theory as History: Essays on Modes of Production and Exploitation*. *Historical Materialism* Book Series, Leiden: Brill.

Bandyopadhyay, A., 2008. Indian initiatives on e-waste management – A critical review. *Environmental Engineering Science*, 25(10), pp.1507–1526.

Banga, R., 2013a. *Global Value Chains: What Role for Aid for Trade?* Economic Affairs Division, Commonwealth Secretariat, Commonwealth Trade Hot Topic Series Issue 100 [Online]. London: The Commonwealth Secretariat. Available at: http://www.secretariat.thecommonwealth.org/files/256049/FileName/TradeHotTopics100FINAL.pdf [Accessed September 5, 2013].

Banga, R., 2013b. *Measuring Value in Global Value Chains*. UNCTAD Background Paper No. RVC-8 [Online]. Geneva: UNCTAD. Available at: http://unctad.org/en/PublicationsLibrary/ecidc2013misc1_bp8.pdf [Accessed March 18, 2014].

Bangasser, P.E., 2000. *The ILO and the Informal Sector: An Institutional History*, Geneva: International Labour Organization.

Barnes, T., 2011. Informalisation and the social relations of production: Insights from urban Karnataka, 1990-2005. *Work Organisation, Labour and Globalisation*, 5(1), pp.58–74.

Barrientos, S., 2001. Gender, flexibility and global value chains. *IDS Bulletin*, 32(3), pp.83–93.

Barrientos, S., 2013. "Labour chains": Analysing the role of labour contractors in global production networks. *The Journal of Development Studies*, 49(8), pp.1058–1071.

Barrientos, A. & Barrientos, S., 2002. *Extending social protection to informal*

*workers in horticultural global value chain*. The World Bank Social Protection Discussion Paper Series No. 0216 [Online]. Washington, D.C.: World Bank. Available at: http://siteresources.worldbank.org/SOCIALPROTECTION/Resources/SP-Discussion-papers/Labor-Market-DP/0216.pdf [Accessed March 17, 2014].

Barrientos, S. & Kritzinger, A., 2003. Squaring the circle: Global production and the informalization of work in South African fruit exports. *Journal of International Development*, 16(1), pp.81–92.

Barrientos, S. & Smith, S., 2007. Do workers benefit from ethical trade? Assessing codes of labour practice in global production systems. *Third World Quarterly*, 28(4), pp.713–729.

Barrientos, S., Dolan, C. & Tallontire, A., 2003. A gendered value chain approach to codes of conduct in African horticulture. *World Development*, 31(9), pp.1511–1526.

Barrientos, S., Gereffi, G. & Rossi, A., 2011. Economic and social upgrading in global production networks: A new paradigm for a changing world. *International Labor Review*, 150(3-4), pp.319-340.

Barrientos, S., Anarfi, J., Lamhauge, N., Castaldo, A. & Akua Anyidoho, N., 2009. *Social Reproduction for Migrant Labour in the Ghanaian Pineapple Sector* [Online]. Development Research Centre on Migration, Globalisation and Poverty Working Paper Number T-30.

Basel Convention, 2011. *Basel Convention: Controlling Transboundary Movements of Hazardous Wastes and Their Disposal Official Website* [Online]. Available at: www.basel.int [Accessed: March 23, 2014].

Basel Convention Fact Sheet, 2011a. *Basel Convention Country Fact Sheet - Singapore* [Online]. Available at: http://www.basel.int/Countries/Countryfactsheets/tabid/1293/ctl/Download/mid/8404/Default.aspx?id=60&ObjID114 [Accessed: April 30, 2013].

Basel Convention Fact Sheet, 2011b. *Basel Convention Country Fact Sheet - Malaysia* [Online]. Available at: http://www.basel.int/Countries/Countryfactsheets/tabid/1293/ctl/Download/mid/8404/Default.aspx?id=42&ObjID=96 [Accessed: April 30, 2013].

Basu Das, S., Menon, J., Severino, R. & Shrestha, O.L., eds., 2013. *The ASEAN Economic Community: A Work in Progress*, Singapore: Institute of Southeast Asian Studies.

Bathelt, H., 2006. Geographies of production: Growth regimes in spatial perspective 3 – toward a relational view of economic action and policy. *Progress in Human Geography*, 30(2), pp.223–236.

Baud, I., Grafakos, S., Hordijk, M. & Post, J., 2001. Quality of life and alliances in solid waste management: Contributions to urban sustainable development.

*Cities*, 18(1), pp.3–12.

Baumol, W., 1974. The transformation of values: What Marx "really" meant (an interpretation). *Journal of Economic Literature*, 12(1), pp.51-62.

Baxter, P. & Jack, S., 2008. Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, 13(4), pp.544–559.

Bernstein, H., 1986. Capitalism and petty commodity production. *Social Analysis*, (20), pp.11–28.

Bernstein, H., 1988. Capitalism and petty-bourgeois production: Class relations and divisions of labour. *The Journal of Peasant Studies*, 15(2), pp.258–271.

Bernstein, H., 2004. The boys from Bothaville, or the rise and fall of king maize: A South African story. *Journal of Agrarian Change*, 4(4), pp.492–508.

Bernstein, H. & Campling, L., 2006a. Commodity studies and commodity fetishism I: Trading down. *Journal of Agrarian Change*, 6(2), pp.239–264.

Bernstein, H. & Campling, L., 2006b. Commodity studies and commodity fetishism II: “Profits with principles?” *Journal of Agrarian Change*, 6(3), pp.414–447.

Bertram, M., Graedel, M., Rechberger, H. & Spatari, S., 2002. The contemporary European copper cycle: Waste management subsystem. *Ecological Economics*, 42(1), pp.43–57.

Bilbao-Osorio, B., Dutta, S. & Lanvin, B. eds., 2013. *The Global Information Technology Report 2013* [Online]. Geneva: World Economic Forum and INSEAD. Available at: http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf [Accessed: March 5, 2014].

Blecker, K.F., 2004. *The Informal Economy*, Stockholm, Sweden: Swedish International Development Cooperation Agency.

Blunch, N.-H., Canagarajah, S. & Raju, D., 2001. *The Informal Sector Revisited: A Synthesis Across Space and Time* [Online]. Washington, D.C.: World Bank. Available at: http://siteresources.worldbank.org/SOCIALPROTECTION/Resources/SP-Discussion-papers/Labor-Market-DP/0119.pdf [Accessed March 17, 2014].

Boeke, J.H., 1953. *Economics and Economic Policy of Dual Societies As Exemplified by Indonesia*, New York: AMS Press.

Bose, P., 1998. Formal–informal sector interaction in rural credit markets. *Journal of Development Economics*, 56(2), pp.265–280.

Boyle, M., 2001. Cleaning up after the Celtic Tiger: The politics of waste management in Ireland. *Journal of the Scottish Association of Geography*

*Teachers*, 30, pp.71–91.

Boyle, M., 2002. Cleaning up after the Celtic Tiger: Scalar “fixes” in the political ecology of Tiger economies. *Transactions of the Institute of British Geographers*, 27(2), pp.172–194.

Breman, J., 1976a. A dualistic labour system? A critique of the 'informal sector' concept: I: The informal sector. *Economic and Political Weekly*, pp.1870–1876.

Breman, J., 1976b. A dualistic labour system? A critique of the 'informal sector' concept: II: A fragmented labour market. *Economic and Political Weekly*, pp.1905–1908.

Breman, J., 1976c. A dualistic labour system? A critique of the 'informal sector' concept: III: Labour force and class formation. *Economic and Political Weekly*, pp.1939–1944.

Breman, J., 1996. *Footloose Labour*, Cambridge: Cambridge University Press.

Breman, J., 2010. *Outcast Labour in Asia: Circulation and Informalization of the Workforce at the Bottom of the Economy*, New Delhi: Oxford University Press.

Bridge, G., 2008. Global production networks and the extractive sector: Governing resource-based development. *Journal of Economic Geography*, 8(3), pp.389–419.

Bridge, G. & Smith, A., 2003. Intimate encounters: Culture - economy - commodity. *Environment and Planning D: Society and Space*, 21(3), pp.257–268.

Bromley, R., 1978. Organization, regulation and exploitation in the so-called 'urban informal sector': The street traders of Cali, Colombia. *World Development*, 6(9), pp.1161–1171.

Bromley, R. & Gerry, C., 1979. Who are the casual poor? In R. Bromley & C. Gerry, eds. *Casual Work and Poverty in Third World Cities*. Chichester: John Wiley & Sons, pp. 3–23.

Brooks, A., 2011. Networks of power and corruption: The trade of Japanese used cars to Mozambique. *The Geographical Journal*, 178(1), pp.80–92.

Brooks, A., 2013. Stretching global production networks: The international second-hand clothing trade. *Geoforum*, 44(C), pp.10–22.

Brooks, A. & Simon, D., 2012. Unravelling the relationships between used-clothing imports and the decline of African clothing industries. *Development and Change*, 43(6), pp.1265–1290.

Brown, E., Derudder, B., Parnreiter, C., Pelupessy, W., Taylor, P.J. & Witlox, F., 2010. World city networks and global commodity chains: Towards a world-systems' integration. *Global Networks*, 10(1), pp.12–34.

Brown, R., 1998. Electronics foreign direct investment in Singapore: A study of local linkages in “Winchester City". *European Business Review*, 98(4), pp.196–210.

Bulkeley, H. & Gregson, N., 2009. Crossing the threshold: Municipal waste policy and household waste generation. *Environment and Planning A*, 41(4), pp.929–945.

Bunnell, T., 2002. Multimedia utopia? A geographical critique of high-tech development in Malaysia’s Multimedia Super Corridor. *Antipode*, 34(2), pp.265–295.

Bunnell, T., 2004. *Malaysia, Modernity and the Multimedia Super Corridor: A Critical Geography of Intelligent Landscapes*, London: Routledge.

Bunnell, T. & Harris, A., 2012. Re-viewing informality: Perspectives from urban Asia. *International Development Planning Review*, 34(4), pp.339-348.

Bunnell, T., Barter, P.A. & Morshidi, S., 2002. City profile: Kuala Lumpur metropolitan area. *Cities*, 19(5), pp.357–370.

Bunnell, T., Miller, M., Marolt, P., Li, H. & Yeo, V., eds., 2011. *Inter-Asia Roundtable 2011: Recycling Cities*, Singapore: Asia Research Institute, National University of Singapore.

Byres, T., 2012. The agrarian question and the peasantry. In B. Fine & A. Saad-Filho, eds. *The Elgar Companion to Marxist Economics*, Cheltenham, UK: Edward Elgar, pp.10-15.

Campling, L., 2012. The Tuna “commodity frontier”: Business strategies and environment in the industrial tuna fisheries of the Western Indian Ocean. *Journal of Agrarian Change*, 12(2-3), pp.252–278.

Campling, L. 2013. Debating modes of production and forms of exploitation: Introduction to the symposium on Jairus Banaji's *Theory as History*, *Historial Materialism*, 21(4), pp.3-10.

Canagarajah, S. & Sethuraman, S.V., 2001. *Social Protection and the Informal Sector in Developing Countries: Challenges and Opportunities.* Social Protection Discussion Paper Series No. 0130 [Online]. Washington, D.C.: World Bank. Available at: http://siteresources.worldbank.org/SOCIALPROTECTION/Resources/SP-Discussion-papers/Labor-Market-DP/0130.pdf [Accessed: March 17, 2014].

Carpenter, C., 2010. *Copper Faces Two-Year Shortage, Will Peak at Over $10,000,Trafigura Says*. Bloomberg News [Online], December 7, 2010. Available at: http://www.bloomberg.com/news/2010-12-07/copper-faces-2-year-shortage-peak-over-10-000-trafigura-says.html [Accessed: February 10, 2014].

Carswell, G. & De Neve, G., 2013. Labouring for global markets: Conceptualising labour agency in global production networks. *Geoforum*, 44, pp.62–70.

Caskey, J.P., 1994. *Fringe Banking: Check Cashing Outlets, Pawnshops, and the Poor*, New York: Russell Sage.

Castel, P. & To, T.-T., 2012. Informal employment in the formal sector: Wages and social security tax evasion in Vietnam. *Journal of the Asia Pacific Economy*, 17(4), pp.616–631.

Castree, N., 2000. Geographic scale and grass-roots internationalism: The Liverpool dock dispute, 1995–1998. *Economic Geography*, 76(3), pp.272–292.

Castree, N., 2007. Labour geography: A work in progress. *International Journal of Urban and Regional Research*, 31(4), pp.853–862.

Castree, N., Coe, N., Ward, K. & Samers, M., 2004. *Spaces of Work: Global Capitalism and Geographies of Labour*, London: SAGE Publications.

Cattaneo, O., Gereffi, G. & Staritz, C., 2010. *Global Value Chains in a Postcrisis World*, Washington, D.C.: World Bank Publications.

Cawson, A., Holmes, P., Stevens, A., Morgan, K. & Webber, D., 1990. *Hostile Brothers: Competition and Closure in the European Electronics Industry*, London: Clarendon Press.

Chakrabarti, S., 2013. Interrogating inclusive growth: Formal-informal duality, complementarity, conflict. *Cambridge Journal of Economics*, 37(6), pp.1349-1379.

Challies, E.R.T., 2008. Commodity chains, rural development and the global agri-food system. *Geography Compass*, 2(2), pp.375–394.

Cheng, L.L. & Gereffi, G., 1994. The informal economy in East Asian development. *International Journal of Urban and Regional Research*, 18(2), pp.194–219.

Chi, X., Streicher-Porte, M., Wang, M.Y.L. & Reuter, M.A., 2011. Informal electronic waste recycling: A sector review with special focus on China. *Waste Management*, 31(4), pp.731–742.

Chia, S.Y., 2013. *The ASEAN Economic Community: Progress, Challenges, and Prospects*. Asian Development Bank Institute Working Paper Series No. 440 [Online]. Tokyo: Asian Development Bank. Available at: http://www.adbi.org/files/2013.10.25.wp440.asean.economic.community.progress.challenges.pdf [Accessed: March 18, 2014].

Chibunna, J.C., Siwar, C., Mohamed, A.F. & Begum, R.A. 2010. Bridging the gaps: An e-waste management and recycling assessment of material recycling facilities in Selangor and Penang. *International Journal of Environmental Sciences*, 1(3), pp.383–391.

Choksi, S., 2001. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal: 1999 protocol on liability and compensation. *Ecology Law Quarterly*, 28(2), pp.509–529.

Chowdhury, H.U., 2005. Informal economy, governance, and corruption. *Philippine Journal of Development*, 32(2), pp.103-134.

Christophers, B., 2011. Follow the thing: Money. *Environment and Planning D: Society and Space*, 29(6), pp.1068–1084.

Chua, B.H., 2000. Public housing residents as clients of the state. *Housing Studies*, 15(1), pp.45-60.

Chua, B.H., 2003. Maintaining housing values under the condition of universal home ownership. *Housing Studies*, 18(5), pp.765-780.

Chua, B.H., 2014. Navigating between limits: The future of public housing in Singapore. *Housing Studies*. Advanced Access. DOI: 10.1080/02673037.2013.874548 [Accessed: February 21, 2014].

Chung, S.-S. & Zhang, C., 2011. An evaluation of legislative measures on electrical and electronic waste in the People's Republic of China. *Waste Management*, 31(12), pp.2638–2646.

Clapp, J., 1997. The illicit trade in hazardous wastes and CFCs: International responses to environmental 'bads'. *Trends in Organized Crime*, 3(2), pp.14–18.

Cling, J.-P., Razafindrakoto, M. & Roubaud, F., 2011. *The Informal Economy in Vietnami* [Online]. Geneva: International Labour Organization. Available at: http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-hanoi/documents/publication/wcms_171370.pdf [Accessed: August 31, 2013].

Cling, J.-P., Razafindrakoto, M. & Roubaud, F., 2012. To be or not to be registered? Explanatory factors behind formalizing non-farm household businesses in Vietnam. *Journal of the Asia Pacific Economy*, 17(4), pp.632–652.

Coe, N.M., 2009. Global production networks. In R. Kitchin & N. Thrift, eds. *International Encyclopedia of Human Geography*. Amsterdam: Elsevier, pp. 556–562.

Coe, N.M., 2012. Geographies of production II: A global production network A-Z. *Progress in Human Geography*, 36(3), pp.389–402.

Coe, N.M., 2013. Geographies of production III: Making space for labour. *Progress in Human Geography*, 37(2), pp.271–284.

Coe, N.M. & Hess, M., 2006. *Global Production Networks: Debates And Challenges* [Online]. Position paper for the GPERG workshop, Mansfield Cooper Building, University of Manchester, 25–26 January 2007. Available at: http://www.sed.manchester.ac.uk/geography/research/gpe/downloads/Manchester_Jan07_positionpaper_final.pdf [Accessed: October 10, 2011].

Coe, N.M. & Hess, M., 2013. Global production networks, labour and development. *Geoforum*, 44, pp.4–9.

Coe, N.M. & Jordhus-Lier, D.C., 2011. Constrained agency? Re-evaluating the geographies of labour. *Progress in Human Geography*, 35(2), pp.211–233.

Coe, N.M. & Lee, Y.S., 2006. The strategic localization of transnational retailers: The case of Samsung-Tesco in South Korea. *Economic Geography*, 82(1), pp.61–88.

Coe, N.M., Dicken, P. & Hess, M., 2008a. Global production networks: Realizing the potential. *Journal of Economic Geography*, 8(3), pp.271–295.

Coe, N.M., Dicken, P. & Hess, M., 2008b. Introduction: Global production networks – debates and challenges. *Journal of Economic Geography*, 8(3), pp.267–269.

Coe, N.M., Dicken, P., Hess, M. & Yeung, H.W.-C., 2010. Making connections: Global production networks and world city networks. *Global Networks*, 10(1), pp.138–149.

Coe, N.M., Hess, M., Yeung, H.W.-C., Dicken, P. & Henderson, J., 2004. "Globalizing"regional development: A global production networks perspective. *Transactions of the Institute of British Geographers*, 29(4), pp.468–484.

Collins, J., 2000. Tracing social relations in commodity chains: The case of grapes in Brazil. In A. Hargerud, M.P. Stone & P.D. Little, eds. *Commodities and Globalization: Anthropological perspectives*, New York: Rowman and Littlefield, pp.97–109.

Colombo, J., 2013. *If This Chart Breaks, Copper And Copper Exporters Will Plunge*. Forbes [Online], November 13, 2013. Available at: http://www.forbes.com/sites/jessecolombo/2013/11/13/if-this-chart-breaks-copper-and-copper-exporters-will-plunge/ [Accessed: December 15, 2013].

Compaine, B.M. ed., 2001. *The Digital Divide: Facing a Crisis Or Creating a Myth?* Massachusetts: MIT Press.

Connolly, C., 2012. *"Singapore is a gold mine": Re-Orienting global trade flows of secondhand electronics* [Online]. Available at: http://discardstudies.com/2012/03/26/singapore-is-a-gold-mine-re-orienting-global-trade-flows-of-secondhand-electronics-guest-post-by-creighton-connolly/ [Accessed: December 10, 2013].

Conti, J.A. & O'Neil, M., 2007. Studying power: Qualitative methods and the global elite. *Qualitative Research*, 7(1), pp.63–82.

Cook, I., 2004. Follow the thing: Papaya. *Antipode*, 36(4), pp.642–664.

Cook, I., 2005. Participant observation, in R. Flowerdew & D. Martin, eds. *Methods in Human Geography*, Harlow, Essex: Pearson Education Limited, pp.167-188.

Cooper, T., 2008. Challenging the "refuse revolution": War, waste and the rediscovery of recycling, 1900–50. *Historical Research*, 81(214), pp.710–731.

Cooper, T., 2009. War on waste?: The politics of waste and recycling in post-war Britain, 1950–1975. *Capitalism Nature Socialism*, 20(4), pp.53–72.

Cooper, T., 2010. Burying the "refuse revolution": The rise of controlled tipping in Britain, 1920 - 1960. *Environment and Planning A*, 42(5), pp.1033–1048.

Cormode, L. & Hughes, A., 1999. The economic geographer as a situated researcher of elites. *Geoforum*, 30, pp.299–300.

Crang, M., 2010. The death of great ships: Photography, politics, and waste in the global imaginary. *Environment and Planning A*, 42(5), pp.1084–1102.

Crang, M., Hughes, A., Gregson, N., Norris, L. & Ahamed, F., 2013. Rethinking governance and value in commodity chains through global recycling networks. *Transactions of the Institute of British Geographers*, 38(1), pp.12–24.

Cross, J.C., 1998. Co-optation, competition, and resistance: State and street vendors in Mexico City. *Latin American Perspectives*, 25(2), pp.41–61.

Cui, J. & Forssberg, E., 2003. Mechanical recycling of waste electric and electronic equipment: A review. *Journal of Hazardous Materials*, 99(3), pp.243–263.

Cullen, R., 2001. Addressing the digital divide. *Online Information Review*, 25(5), pp.311–320.

Cumbers, A., Nativel, C. & Routledge, P., 2008. Labour agency and union positionalities in global production networks. *Journal of Economic Geography*, 8(3), pp.369–387.

*Customs (Prohibition of Exports) Act 2012* [Online]. Kuala Lumpur: Attorney General's Chambers. http://www.env.go.jp/en/recycle/asian_net/Country_Information/Law_N_Regulation/Malaysia/pua_20121231_Larangan%20Export.pdf [Accessed January 20, 2011].

Daniels, P.W., 2004. Urban challenges: The formal and informal economies in mega-cities. *Cities*, 21(6), pp.501–511.

Darke, P., Shanks, G. & Broadbent, M., 1998. Successfully completing case study research: Combining rigour, relevance and pragmatism. *Information Systems Journal*, 8(4), pp.273–289.

Davies, A.R., 2005. Incineration politics and the geographies of waste governance: A burning issue for Ireland? *Environment and Planning C: Government and Policy*, 23(3), pp.375–397.

Davies, A.R., 2008. *The Geographies of Garbage Governance: Interventions, Interactions, and Outcomes*, Surrey: Ashgate Publishing.

Davies, G. & Dwyer, C., 2007. Qualitative methods: Are you enchanted or are you alienated? *Progress in Human Geography*, 31(2), pp.257–266.

Davies, G. & Dwyer, C., 2008. Qualitative methods II: Minding the gap. *Progress in Human Geography*, 32(3), pp.399–406.

Davies, R., 1979. Informal sector or subordinate mode of production? A model. In R. Bromley & C. Gerry, eds. *Casual Work and Poverty in Third World Cities*. Chichester: John Wiley & Sons, pp. 87–104.

Daviron, B. & Ponte, S., 2005. *The Coffee Paradox: Global Markets, Commodity Trade and the Elusive Promise of Development*, London: Zed Books.

Davis, G. & Wolski, M., 2009. E-waste and the sustainable organisation: Griffith University's approach to e-waste. *International Journal of Sustainability in Higher Education*, 10(1), pp.21–32.

Dawley, S., 2007. Fluctuating rounds of inward investment in peripheral regions: Semiconductors in the North East of England. *Economic Geography*, 83, pp.51-73.

de Oliveira, C.R., Bernardes, A.M. & Gerbase, A.E., 2012. Collection and recycling of electronic scrap: A worldwide overview and comparison with the Brazilian situation. *Waste Management*, 32(8), pp.1592–1610.

de Soto, H., 1989. *The Other Path: The Invisible Revolution in the Third World*, London: I.B. Tauris and Co Ltd.

Denzin, N.K., 2001. The reflexive interview and a performative social science. *Qualitative Research*, 1(1), pp.23–46.

Department of Environment, Malaysia, 2014. *Department of Environment, Ministry of Natural Resources and Environment, Malaysia Official Website* [Online]. Available at: www.doe.gov.my [Accessed: March 10, 2014].

Department of Statistics, Malaysia, 2011. *Population Distribution and Basic Demographic Characteristics 2010*, Putrajaya: Department of Statistics, Malaysia.

Department of Statistics, Malaysia, 2013. *Household Income and Basic Amenities Survey Report 2012*, Putrajaya: Department of Statistics, Malaysia.

Department of Statistics, Singapore, 2013a. *Singapore in Figures 2013*, Singapore: Department of Statistics, Singapore.

Department of Statistics, Singapore, 2013b. *Key Household Income Trends 2012*, Singapore: Department of Statistics, Singapore.

Desmond, M., 2004. Methodological challenges posed in studying an elite in the field. *Area*, 36(3), pp.262–269.

Dewalt, K.M., Dewalt, B.R. & Wayland, C.B., 1998. Participant observation, in H.R. Bernard, ed. *Handbook of Methods in Cultural Anthropology*, Walnut Creek, California: AltaMira Press, pp.259-299.

Dewan, S. & Riggins, F.J., 2005. The digital divide: Current and future research directions. *Journal of the Association for Information Systems*, 6(9), pp.298-336.

Dicken, P., 1990. Seducing foreign investors. In M. Hebbert & J.C. Hansen, eds. *Unfamiliar Territory*, Aldershot: Gower, pp.162-186.

Dicken, P., 2004. Geographers and "globalization":(Yet) another missed boat? *Transactions of the Institute of British Geographers*, 29(1), pp.5–26.

Dicken, P., 2011. *Global Shift: Mapping the Changing Contours of the World Economy*, 6th edition, London: SAGE Publications Limited.

Dicken, P. & Tickell, A., 1992. Competitors or collaborators? *Regional Studies*, 26, pp.99-106.

Dicken, P., Kelly P., Olds, K. & Yeung, H.W.-C., 2001. Chains and networks, territories and scales: Towards a relational framework for analysing the global economy. *Global Networks*, 1(2), pp.89–112.

Dolan, C. & Humphrey, J., 2000. Governance and trade in fresh vegetables: The impact of UK supermarkets on the african horticulture industry. *Journal of Development Studies*, 37(2), pp.147–176.

Dolan, C.S., 2004. On farm and packhouse: Employment at the bottom of a global value chain. *Rural Sociology*, 69(1), pp.99–126.

Dossani, R. & Kenney, M., 2007. The next wave of globalization: Relocating service provision to India. *World Development*, 35(5), pp.772–791.

Douglas, M., 1966. *Purity and Danger*, London: Routledge.

Dunn, E., 2007. Of pufferfish and ethnography: Plumbing new depths in economic geography. In A. Tickell, E. Sheppard, J. Peck & T. Barnes, eds. *Politics and Practice in Economic Geography*. London: SAGE Publications, pp. 82–92.

Duménil, G., 1984. Beyond the transformation riddle: A labour theory of value. *Science and Society*, 47(4), pp.427-450.

Duvall, T., 2012. Singapore. In C.A. Zimring & W.L. Rathje, eds. *Encyclopedia of Consumption and Waste: The Social Science of Garbage*, London, SAGE Publications, pp.817-820.

Dwivedy, M. & Mittal, R.K., 2010. Future trends in computer waste generation in India. *Waste Mangement*, 30(11), pp.2265-2277.

Dwivedy, M. & Mittal, R.K., 2012. An investigation into e-waste flows in India. *Journal of Cleaner Production*, 37, pp.229–242.

Dwivedy, M. & Mittal, R.K., 2013. Willingness of residents to participate in e-waste recycling in India. *Environmental Development*, 6, pp.48-68..

Dwyer, C. & Davies, G., 2010. Qualitative methods III: Animating archives, artful

interventions and online environments. *Progress in Human Geography*, 34(1), pp.88–97.

Ekinsmyth, C., 2011. Challenging the boundaries of entrepreneurship: The spatialities and practices of UK "Mumpreneurs." *Geoforum*, 42(1), pp.104–114.

Elms, D.K. &Low, P., 2013. *Global Value Chains in a Changing World*. In D. K. Elms & P. Low, eds. Geneva: World Trade Organization, Fung Global Institute, Temasek Foundation Centre for Trade and Negotiations. Available at: http://www.wto.org/english/res_e/booksp_e/aid4tradeglobalvalue13_e.pdf [Accessed: January 10, 2014].

Elson, D., 1979. The value theory of labour. In D. Elson, ed. *Value: The Representation of Labour in Capitalism*. London: CSE Books, pp. 115–180.

Elson, D., 1998. The economic, the political and the domestic: Businesses, states and households in the organisation of production. *New Political Economy*, 3(2), pp.189–208.

Elson, D., 1999. Labour markets as gendered institutions: Equality, efficiency and empowerment issues. *World Development*, 27(3), pp.611-627.

*Environmental Quality Act 1974* [Online]. Kuala Lumpur: Federal Government of Malaysia. Available at: http://www.agc.gov.my/Akta/Vol.%203/Act%20127.pdf [Accessed: January 20, 2011].

Ernst, D., 2002. Global production networks and the changing geography of innovation systems: Implications for developing countries. *Economics of Innovation and New Technology*, 11(6), pp.497–523.

Ernst, D. & Kim, L., 2002. Global production networks, knowledge diffusion and local capability formation: a conceptual framework. *Research Policy*, 31(8), pp.1417–1429.

European Environment Agency, 2009. *Waste Without Borders in the EU? Transboundary Shipments of Waste* [Online]. Copenhagen: European Environment Agency. Available at: http://www.eea.europa.eu/publications/waste-without-borders-in-the-eu-transboundary-shipments-of-waste [Accessed March 15, 2014].

Evans, D., Kaplinsky, R. & Robinson, S., 2006. Deep and shallow integration in Asia: Towards a holistic account. *IDS Bulletin*, 37(1), pp.12–22.

Ezeah, C., Fazakerley, J.A. & Roberts, C.L., 2013. Emerging trends in informal sector recycling in developing and transition countries. *Waste Management*, 33(11), pp.2509–2519.

Faundez, J., 2009. Empowering workers in the informal economy. *Hague Journal on the Rule of Law*, 1(1), pp.156-172.

Fine, B., 1983. A dissenting note on the transformation problem. *Economy and Society*, 12(4), pp.520-525.

Fine, B., 2002. *The World of Consumption*, Second Edition, London: Routledge.

Fine, B., 2012. Exploitation and surplus value. In B. Fine & A. Saad-Filho, eds. *The Elgar Companion to Marxist Economics*, Cheltenham, UK: Edward Elgar, pp. 118-124.

Fine, B., Lapavitsas, C. & Saad-Filho, A., 2004. Transforming the transformation problem: Why the 'new interpretation' is a wrong turning. *Review of Radical Political Economics*, 36(1), pp.3-19.

Finlay, A., 2005. *E-waste challenges in developing countries: South Africa case study*. Association for Progressive Communications Issue Papers [Online]. Available at: https://www.apc.org/en/system/files/e-waste_EN.pdf [Accessed March 15, 2014].

Fischer, T., 2009. The Shipping News. *Scrap*, (May/June 2009). Available at: http://www.scrap.org/ArticlesArchive/2009/May-June/the_shipping_news.htm [Accessed: June 9, 2011].

Flyvbjerg, B., 2006. Five misunderstandings about case-study research. *Qualitative Inquiry*, 12(2), pp.219–245.

Fold, N., 2002. Lead firms and competition in “bi-polar”commodity chains: Grinders and branders in the global cocoa-chocolate industry. *Journal of Agrarian Change*, 2(2), pp.228–247.

Fold, N., 2008. Transnational sourcing practices in Ghana's perennial crop sectors. *Journal of Agrarian Change*, 8(1), pp.94–122.

Friedmann, H., 1986. Patriarchal commodity production. *Social Analysis*, 20, pp.47–55.

Frow, J., 2003. Invidious distinction: Waste, difference and classy stuff. In G. Hawkins & S. Muecke, eds. *Culture and Waste: The Creation and Destruction of Value*. Boulder, Colorado: Rowman & Littlefield, pp. 25–38.

Gandy, M., 1993. *Recycling and Waste: An Exploration of Contemporary Environmental Policy*, Surrey: Ashgate Publishing.

Gandy, M., 1994. *Recycling and the Politics of Urban Waste*, London: Palgrave Macmillan.

Geertz, C., 1963. *Peddlers and Princes: Social Development and Economic Change in Two Indonesian Towns*, Chicago: University of Chicago Press.

Gellert, P.K., 2003. Renegotiating a timber commodity chain: Lessons from Indonesia on the political construction of global commodity chains. *Sociological Forum*, 18(1), pp.53–84.

Gereffi, G., 1994. The Organization of Buyer-driven Global Commodity Chains: How U.S. Retailers Shape Overseas Production Networks. In G. Gereffi & M. Korzeniewicz, eds. *Commodity Chains and Global Capitalism*. Westport, Connecticut: Praeger Publishers, pp. 95–122.

Gereffi, G., 1995. Global production systems and Third World development. In B. Stallings, ed. *Global Change, Regional Response: The New International Context of Development*. Cambridge, UK: Cambridge University Press, pp. 100–142.

Gereffi, G., 1999. *A Commodity Chains Framework for Analyzing Global Industries*. Background Notes for Workshop on Spreading the Gains from Globalisation. Sussex: Institute of Development Studies. Available at: http://eco.ieu.edu.tr/wp-content/Gereffi_CommodityChains99.pdf [Accessed: November 10, 2010].

Gereffi, G. & Bair, J., 1998. US companies eye NAFTA's prize. *Bobbin*, 39(7), pp.26-35.

Gereffi, G. & Fernandez-Stark, K., 2011. *Global Value Chain Analysis: A Primer* [Online]. Durham, NC: Center on Globalization, Governance & Competitiveness. Available at: http://www.cggc.duke.edu/pdfs/2011-05-31_GVC_analysis_a_primer.pdf [Accessed: April 10, 2013].

Gereffi, G. & Korzeniewicz, M. eds., 1994. *Commodity Chains and Global Capitalism*, Westport, Connecticut: Praeger Publishers.

Gereffi, G., Humphrey, J. & Kaplinsky, R., 2001. Introduction: Globalisation, value chains and development. *IDS Bulletin*, 32(3), pp.1–8.

Gereffi, G., Humphrey, J. & Sturgeon, T., 2005. The governance of global value chains. *Review of International Political Economy*, 12(1), pp.78–104.

Gereffi, G., Korzeniewicz, M. & Korzeniewicz, R.P., 1994. Introduction: Global Commodity Chains. In G. Gereffi & M. Korzeniewicz, eds. *Commodity Chains and Global Capitalism*. Westport, Connecticut: Praeger Publishers, pp. 1–14.

Germidis, D., Kessler, D. & Meghir, R., 1991. *Financial Systems and Development: What Role For the Formal and Informal Financial Sectors?* Paris: OECD Publishing.

Gerry, C., 1978. Petty production and capitalist production in Dakar: The crisis of the self-employed. *World Development*, 6(9/10), pp.1147-1160.

Gerry, C. & Birkbeck, C., 1981. The petty commodity producer in Third World cities: Petit-bourgeois or “disguised” proletarian? In F. Bechhofer & B. Elliott, eds. *The Petite Bourgeoisie: Comparative Studies of the Uneasy Stratum*. London: Macmillian Press, pp. 121–154.

Gerxhani, K., 2004. The informal sector in developed and less developed countries: A literature survey. *Public Choice*, 120(3-4), pp.267–300.

Gibbon, P., 2001. Upgrading primary production: A global commodity chain approach. *World Development*, 29(2), pp.345–363.

Gibbon, P., 2003. *Commodities, Donors, Value-chain Analysis and Upgrading*, Paper Prepared for UNCTAD. Available at: http://ictsd.org/downloads/2008/08/gibbon.pdf [Accessed: January 5, 2011].

Gibbon, P., 2008. Governance, entry barriers, upgrading: A re-interpretation of some GVC concepts from the experience of African clothing exports. *Competition & Change*, 12(1), pp.29–48.

Gibbon, P. & Ponte, S., 2008. Global value chains: From governance to governmentality? *Economy and Society*, 37(3), pp.365–392.

Gibbon, P., Bair, J. & Ponte, S., 2008. Governing global value chains: An introduction. *Economy and Society*, 37(3), pp.315–338.

Gibson-Graham, J.K., 2008. Diverse economies: Performative practices for 'other worlds'. *Progress in Human Geography*, 32(5), pp.613–632.

Gilbert, M., 1998. "Race", space and power: The survival strategies of working poor women. *Annals of the Association of American Geographers*, 88(4), pp.595-621.

Gill, K., 2009. *Of Poverty and Plastic: Scavenging and Scrap Trading Entrepreneurs in India's Urban Informal Economy*, Oxford: Oxford University Press.

Gille, Z., 2010. Actor networks, modes of production, and waste regimes: Reassembling the macro-social. *Environment and Planning A*, 42(5), pp.1049–1064.

Giuliani, E., Pietrobelli, C. & Rabellotti, R., 2005. Upgrading in global value chains: Lessons from Latin American clusters. *World Development*, 33(4), pp.549–573.

Glassman, J., 2011. The geo-political economy of global production networks. *Geography Compass*, 5(4), pp.154-164.

Goodman, D. & Redclift, M., 1985. Capitalism, petty commodity production and the farm enterprise. *Sociologia Ruralis*, 25(3-4), pp.231–247.

Grant, R. & Oteng-Ababio, M., 2012. Mapping the invisible and real “African” economy: Urban e-waste circuitry. *Urban Geography*, 33(1), pp.1–21.

Green, D.J., 2008. The role of ASEAN economic community as a commitment to policy certainty. *ASEAN Economic Bulletin*, 25(2), pp.209–227.

Gregson, N., 2009. Material, literary narrative and cultural economy. *Journal of Cultural Economy*, 2(3), pp.285–300.

Gregson, N. & Crang, M., 2010. Materiality and waste: Inorganic vitality in a networked world. *Environment and Planning A*, 42(5), pp.1026–1032.

Gregson, N. & Crewe, L., 2003. *Second-Hand Cultures*, London: Bloomsbury

Publishers.

Gregson, N., Crang, M., Ahamed, F., Akhter, N. & Ferdous, R., 2010. Following things of rubbish value: End-of-life ships, “chock-chocky” furniture and the Bangladeshi middle class consumer. *Geoforum*, 41(6), pp.846–854.

Gregson, N., Crang, M., Laws, J., Fleetwood, T. & Holmes, H., 2013. Moving up the waste hierarchy: Car boot sales, reuse exchange and the challenges of consumer culture to waste prevention. *Resources, Conservation and Recycling*, 77, pp.97–107.

Gregson, N., Metcalfe, A. & Crewe, L., 2007. Identity, mobility, and the throwaway society. *Environment and Planning D: Society and Space*, 25(4), pp.682–700.

Guha-Khasnobis, B., Kanbur, R. & Ostrom, E., 2006. Beyond formality and informality. In B. Guha-Khasnobis, R. Kanbur, & E. Ostrom, eds. *Linking the Formal and Informal Economy: Concepts and Policies*. Oxford: Oxford University Press, pp.1-20.

Guthman, J., 2009. Unveiling the unveiling: Commodity chains, commodity fetishism and the "value" of voluntary, ethical food labels. In J. Bair, ed. *Frontiers of Commodity Chain Research*, Stanford: Stanford University Press, pp.190-206.

Günther, I. & Launov, A., 2012. Informal employment in developing countries. *Journal of Development Economics*, 97(1), pp.88–98.

Hagelüken, C., 2008. Mining our computers: Opportunities and challenges to recover scarce and valuable metals from electronic devices. Presentation at Electronics Goes Green 2008+ Conference, Berlin, 9 Sept 2008. Available at: http://egg2008.izm.fraunhofer.de/servlet/is/5143/20080909_Hagel%C3%BCken_-_Umicore_(EGG2008_presentation_slides).pdf?command=downloadContent&filename=20080909_Hagel%FCken_-_Umicore_(EGG2008_presentation_slides).pdf [Accessed: May 20, 2012].

Hagelüken, C., 2013. Recycling of Precious and Special Metals. In M. Angrick, A. Burger, & H. Lehmann, eds. *Factor X: Re-source - Designing the Recycling Society*. Dordrecht: Springer, pp. 221–241.

Hagelüken, C. & Meskers, C.E.M., 2012. Recycling of Technology Metals: A Holistic System Approach. In K. Hieronymi, R. Kahhat, & E. Williams, eds. *E-waste Management*. London: Routledge, pp. 49–78.

Hale, A. & Opondo, M., 2005. Humanising the cut flower chain: Confronting the realities of flower production for workers in Kenya. *Antipode*, 37(2), pp.301–323.

Hale, A. & Wills, J., 2007. Women working worldwide: Transnational networks, corporate social responsibility and action research. *Global Networks*, 7(4), pp.453–476.

Harriss, J., 1982. Character of an urban economy: 'Small-scale' production and labour markets in Coimbatore. *Economic and Political Weekly*, 17(24), pp.993-1002.

Harriss-White, B., 2012. Capitalism and the common man: Peasants and petty production in Africa and South Asia. *Agrarian South: Journal of Political Economy*, 1(2), pp.109–160.

Harriss-White, B. & Gooptu, N., 2001. Mapping India's world of unorganised labour. In L. Panitch & C. Leys, eds. *The Socialist Register 2000: Working Classes, Global Realities*, London: Merlin Press, pp.89-118.

Hart, K., 1973. Informal income opportunities and urban employment in Ghana. *The Journal of Modern African Studies*, 11(01), pp.61–89.

Hart, K., 2005. *Formal bureaucracy and the emergent forms of the informal economy*. UNU-WIDER Research Paper No. 2005/11 [Online]. Helsinki: United Nations University. Available at: http://www.wider.unu.edu/publications/working-papers/research-papers/2005/en_GB/rp2005-11/ [Accessed: June 25, 2011].

Harvey, D., 2011. Roepke lecture in economic geography – Crises, geographic disruptions and the uneven development of political responses. *Economic Geography*, 87(1), pp.1–22.

Hassler, M., 2003. The global clothing production system: Commodity chains and business networks. *Global Networks*, 3(4), pp.513–531.

Hazarika, S., 1987. *Bhopal, the Lessons of a Tragedy*, London: Penguin Books.

Helms, G. & Cumbers, A., 2006. Regulating the new urban poor: Local labour market control in an old industrial city. *Space and Polity*, 10(1), pp. 67-86.

Henderson, G., 2013. *Value In Marx: The Persistence of Value in a More-Than-Capitalist World*, Minneapolis: University of Minnesota Press.

Henderson, J., Dicken, P., Hess, M., Coe, N.M. & Yeung, H.W.-C., 2002. Global production networks and the analysis of economic development. *Review of International Political Economy*, 9(3), pp.436–464.

Henry, S., 1981. Introduction. In S. Henry, ed. *Can I Have It In Cash? A Study of Informal Institutions and Unorthodox Ways of Doing Things*. London: Astragal Books, pp. 1–25.

Henson, S. & Humphrey, J., 2010. Understanding the complexities of private standards in global agri-food chains as they impact developing countries. *The Journal of Development Studies*, 46(9), pp.1628-1646.

Herat, S., 2008. Recycling of cathode ray tubes (CRTs) in electronic waste. *CLEAN – Soil, Air, Water*, 36(1), pp.19–24.

Herat, S. & Agamuthu, P., 2012. E-waste: A problem or an opportunity? Review of issues, challenges and solutions in Asian countries. *Waste Management & Research*, 30(11), pp.1113–1129.

Herod, A., 1997. From a geography of labor to a labor geography: Labor's spatial fix and the geography of capitalism. *Antipode*, 29(1), pp.1-31.

Herod, A., 1999. Using industrial disputes to teach about economic geography. *Journal of Geography*, 98(5), pp.229–241.

Herod, A., 2000. Labor unions and economic geography. In E. Sheppard & T.J. Barnes, eds. *A Companion to Economic Geography*. Oxford: Blackwell, pp.341-358.

Herod, A., 2012. Workers as geographical actors. *Labor History*, 53(3), pp.335–353.

Herod, A., Pickren, G., Rainnie, A. & McGrath-Champ, S., 2013. Waste, commodity fetishism and the ongoingness of economic life. *Area*, 45(3), pp.376–382.

Herod, A., Pickren, G., Rainnie, A. & McGrath-Champ, S., 2014. Global destruction networks, labour and waste. *Journal of Economic Geography*, 14(2), pp.421–441.

Hess, M., 2004. “Spatial” relationships? Towards a reconceptualization of embeddedness. *Progress in Human Geography*, 28(2), pp.165–186.

Hess, M. & Coe, N.M., 2006. Making connections: Global production networks, standards, and embeddedness in the mobile-telecommunications industry. *Environment and Planning A*, 38(7), pp.1205–1227.

Hess, M. & Yeung, H.W.-C., 2006. Whither global production networks in economic geography? Past, present and future. *Environment and Planning A*, 38(6), pp.1193-1204.

Hew, D. & Soesastro, H., 2003. Realizing the ASEAN economic community by 2020: ISEAS and ASEAN-ISIS approaches. *ASEAN Economic Bulletin*, 20(3), pp.292–296.

Hibou, B., 1999. The “social capital” of the state as an agent of deception. In J. F. Bayart, S. Ellis, & B. Hibou, eds. *The Criminalization of the State in Africa*. Oxford: Indiana University Press.

Hieronymi, K., Kahhat, R. & Williams, E., eds., 2012. *E-waste Management*, London: Routledge.

Ho, D.K.H., Teh, R.Y.C., Tham, K.W. & Briffett, C., 1997. The greening of Singapore's national estate. *Habitat International*, 21(1), pp.107–121.

Hobday, M., 1994. Export-led technology development in the four dragons: The case of electronics. *Development and Change*, 25(2), pp.333–361.

Hopkins, T.K. & Wallerstein, I., 1986. Commodity chains in the world-economy prior to 1800. *Review (Fernand Braudel Center)*, 10(1), pp.157–170.

Housing and Development Board, Singapore, 2014a. *Buying a Resale Flat Eligibility to Buy* [Online]. Singapore: Housing and Development Board. Available at: http://www.hdb.gov.sg/fi10/fi10321p.nsf/w/BuyResaleFlatEligibilitytobuy?OpenDocument [Accessed: January 20, 2014].

Housing and Development Board, Singapore, 2014b. *Buying a New Flat: Eligibility to Buy a New HDB Flat* [Online]. Singapore: Housing and Development Board. Available at: http://www.hdb.gov.sg/fi10/fi10321p.nsf/w/BuyingNewFlatEligibilitytobuynewHDBflat?OpenDocument [Accessed: January 20, 2014].

Housing and Development Board, Singapore, 2014c. *Public Rental Scheme* [Online]. Singapore: Housing and Development Board. Available at: http://www.hdb.gov.sg/aa11/isrr018p.nsf/PPSConditions [Accessed: January 20, 2014].

Hudson, R., 2005. *Economic Geographies: Circuits, Flows and Spaces*, London: SAGE Publications.

Hudson, R., 2008a. Cultural political economy meets global production networks: A productive meeting? *Journal of Economic Geography*, 8(3), pp.421–440.

Hudson, R., 2008b. Material matters and the search for resilience: Rethinking regional and urban development strategies in the context of global environmental change. *International Journal of Innovation and Sustainable Development*, 3(3), pp.166–184.

Hudson, R., 2009. The costs of globalization: Producing new forms of risk to health and well-being. *Risk Management*, 11(1), pp.13–29.

Hughes, A. & Reimer, S., 2004. Introduction. In A. Hughes & S. Reimer, eds. *Geographies of Commodity Chains*. London: Routledge, pp. 1–16.

Hughes, A., McEwan, C. & Bek, D., 2013. Retailers, supply networks and changing articulations of ethicality: Lessons from Flower Valley in South Africa. *Journal of Economic Geography*, 13(2), pp.211–230.

Humphrey, J. & Schmitz, H., 2001. Governance in global value chains. *IDS Bulletin*, 32(3), pp.19–29.

Humphrey, J. & Schmitz, H., 2002. How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies*, 36(9), pp.1017–1027.

Humphrey, J. & Schmitz, H., 2004. Governance in global value chains. In H. Schmitz, ed. *Local Enterprises in the Global Economy: Issues of Governance and Upgrading*, Cheltenham, UK: Edward Elgar, pp.95-109.

Huong, T.S.T.M., 2009. The flow of E-waste material in the Asian region and a

reconsideration of international trade policies on E-waste. *Environmental Impact Assessment Review*, 29(1), pp.25–31.

ILO, 2002a. *Decent work and the informal economy*. International Labour Conference 90th Session Report VI [Online]. Geneva: International Labour Organization. Available at: http://www.ilo.org/public/english/standards/relm/ilc/ilc90/pdf/rep-vi.pdf [Accessed March 17, 2014].

ILO, 2002b. *Women and men in the informal economy: a statistical picture.* International Labour Office [Online]. Geneva: International Labour Organization. Available at: http://www.ilo.org/dyn/infoecon/docs/441/F596332090/women%20and%20men%20stat%20picture.pdf [Accessed March 17, 2014].

IMF, 2013a. *Trade Interconnectedness: The World With Global Value Chains* [Online]. Washington, D.C.: International Monetary Fund. Available at: http://www.imf.org/external/np/pp/eng/2013/082613.pdf [Accessed March 10, 2014].

IMF, 2013b. *World Economic Outlook* [Online]. Washington, D.C.: International Monetary Fund. Available at: http://www.imf.org/external/pubs/ft/weo/2013/02/weodata/index.aspx [Accessed March 10, 2014].

INTERPOL, 2009. *Electronic Waste and Organized Crime - Assessing the Links* (Phase II Report for the INTERPOL Pollution Crime Working Group) [Online]. Lyon, France: International Criminal Police Organization. Available at: http://www.interpol.int/content/download/5367/45070/version/3/file/Wastereport.pdf [Accessed: July 2, 2012].

Ismail, I., 2014. Mining e-waste. *New Straits Times*, April 21, 2014, p.8.

Ivarsson, I. & Alvstam, C.G., 2009. Local technology linkages and supplier upgrading in global value chains: The case of Swedish engineering TNCs in emerging markets. *Competition & Change*, 13(4), pp.368–388.

Ivarsson, I. & Alvstam, C.G., 2011. Upgrading in global value-chains: A case study of technology-learning among IKEA-suppliers in China and Southeast Asia. *Journal of Economic Geography*, 11(4), pp.731–752.

Ivarsson, I. & Alvstam, C.G., 2013. Embedded internationalization. *Asian Business Management*, 12(5), pp.565–589.

Jackson, P., 1983. Principles and problems of participant observation, *Geografiska Annaler Series B*, 65(1), pp.39-46.

Jackson, P., Ward, N. & Russell, P., 2006. Mobilising the commodity chain concept in the politics of food and farming. *Journal of Rural Studies*, 22(2), pp.129–141.

James, A., 2006. Critical moments in the production of 'rigorous' and 'relevant'

cultural economic geographies. *Progress in Human Geography*, 30(3), pp.289–308.

James, J., 2000. Newspaper wars - Charity project versus karang guni. *The Straits Times*, October 27, 2000.

James, J., 2001. Paper war - Karang guni men versus CDCs. *The Straits Times*, June 26, 2001.

Janz, A. & Bilitewski, B., 2008. Hazardous substances in waste electrical and electronic equipment - Toxicity and release. In R. Johri, ed. *E-Waste: Implications, Regulations, and Management in India and Current Global Best Practices*. New Delhi, India: TERI Press, pp. 91–120.

Jofre, S. & Morioka, T., 2005. Waste management of electric and electronic equipment: Comparative analysis of end-of-life strategies. *Journal of Material Cycles and Waste Management*, 7(1), pp.24–32.

Johansson, J. & Luttropp, C., 2009. Material hygiene: Improving recycling of WEEE demonstrated on dishwashers. *Journal of Cleaner Production*, 17(1), pp.26–35.

Johns, J., 2006. Video games production networks: Value capture, power relations and embeddedness. *Journal of Economic Geography*, 6, pp.151-180.

Jones, A. & Murphy, J.T., 2010. Practice and economic geography. *Geography Compass*, 4(4), pp.303–319.

Jones, A. & Murphy, J.T., 2011. Theorizing practice in economic geography: Foundations, challenges, and possibilities. *Progress in Human Geography*, 35(3), pp.366–392.

Jones, L., Powers, W. & Ubee, R., 2013. *Making Global Value Chain Research More Accessible* [Online]. Washington, D.C.: United States International Trade Commission. Available at: http://www.usitc.gov/publications/332/working_papers/EC201310A.pdf [Accessed March 16, 2014].

Kahhat, R. & Williams, E., 2012. Materials flow analysis of e-waste: Domestic flows and exports of used computers from the United States. *Resources, Conservation and Recycling*, 67, pp.67–74.

Kalana, J.A., 2010. Electrical and electronic waste management practices by households in Shah Alam, Selangor, Malaysia. *International Journal of Environmental Sciences*, 1(2), pp.132-144.

Kalra, V., 2004. *E-waste in India: System failure imminent: Take action now!* [Online]. Available at: http://toxicslink.org/docs/06040_repsumry.pdf [Accessed March 15, 2014].

Kaplinsky, R., 1998. *Globalisation, Industrialisation And Sustainable Growth: The Pursuit Of The Nth Rent*. IDS Discussion Paper 365. Sussex: Institute of

Development Studies. Available at: http://www.ids.ac.uk/files/Dp365.pdf [Accessed: March 10, 2011].

Kaplinsky, R., 2000. Globalisation and unequalisation: What can be learned from value chain analysis? *Journal of Development Studies*, 37(2), pp.117–146.

Kaplinksy, R., 2010. *The Role of Standards in Global Value Chains and their Impact on Economic and Social Upgrading* [Online]. Washington, D.C.: World Bank. Available at: http://oro.open.ac.uk/22235/2/Kaplinsky_WB_report.pdf [Accessed: January 18, 2013].

Katusiimeh, M.W., Burger, K. & Mol, A.P.J., 2013. Informal waste collection and its co-existence with the formal waste sector: The case of Kampala, Uganda. *Habitat International*, 38(C), pp.1–9.

Katz, C., 2001. Vagabond capitalism and the necessity of social reproduction. *Antipode*, 33(4), pp.709-728.

Kay, G., 1979. Why labour is the starting point of capital. In D. Elson, ed. *Value: The Representation of Labour in Capitalism*. London: CSE Books, pp. 46–66.

Keck, M., 2012. Informality as borrowed security: Contested food markets in Dhaka, Bangladesh. In C. McFarlane & M. Waibel, eds. *Urban Informalities: Reflections on the Formal and Informal*. Surrey, England: Ashgate Publishing Limited, pp. 111–128.

Kellenberg, D., 2012. Trading wastes. *Journal of Environmental Economics and Management*, 64(1), pp.68–87.

Kelly, P.F., 2009. From global production networks to global reproduction networks: Households, migration, and regional development in Cavite, the Philippines. *Regional Studies*, 43(3), pp.449-461.

Kelly, P.F., 2011. Space, place and labour. In A. Leyshon, R. Lee, L. McDowell & P. Sunley, eds. *The SAGE Handbook of Economic Geography*, London: SAGE Publications, pp.149-161.

Kelly, P.F., 2013. Production networks, place and development: Thinking through global production networks in Cavite, Philippines. *Geoforum*, 44, pp.82–92.

Kennedy, P., 1981. The role and position of petty producers in a West African city. *Journal of Modern African Studies*, 19(4), pp.565–594.

Khoo, H., 2008. Fighting for rubbish. *The New Paper*, August 24, 2008.

Kikuchi, R., 2001. Recycling of municipal solid waste for cement production: Pilot-scale test for transforming incineration ash of solid waste into cement clinker. *Resources, Conservation and Recycling*, 31(2), pp.137–147.

King, N., 2004. Using interviews in qualitative research. In C. Cassell & G. Symon, eds. *Essential Guide to Qualitative Methods in Organizational Research*. London:

SAGE Publications, pp. 11–22.

Kiser, K. & Zagone, E., 1996. Exports explored - Where U.S. scrap has gone. *Scrap*, (May/June 1996). Available at: http://www.scrap.org/ArticlesArchive/1996/MAY-JUN/Exports.HTM [Accessed: April 24, 2012].

Klenovšek, A. & Meško, G., 2011. International waste trafficking: Preliminary explorations. In G. Meško, D. Dimitrijević & C.B. Fields, eds. *Understanding and Managing Threats to the Environment in South Eastern Europe*. Dordrecht: Springer, pp.79-99.

Knorringa, P. & Pegler, L., 2006. Globalisation, firm upgrading and impacts on labour. *Tijdschrift voor Economische en Sociale Geografie*, 97(5), pp.470–479.

Kojima, M., 2005. Transboundary movements of recyclable resources in Southeast Asia. In M. Kojima, ed. *International Trade of Recyclable Resources in Asia*. Tokyo: IDE-JETRO, pp. 85–94. Available at: http://www.ide.go.jp/English/Publish/Download/Spot/29.html [Accessed: January 10, 2012].

Kreibe, S., 2012. Current and new electronic waste recycling technologies. In K. Hieronymi, R. Kahhat, & E. Williams, eds. *E-waste Management*. London: Routledge, pp. 25–48.

Kummer, K., 1992. The international regulation of transboundary traffic in hazardous wastes: The 1989 Basel Convention. *International and Comparative Law Quarterly*, 41(3), pp.530–562.

Kurfurst, S., 2012. Informality as a strategy: Street traders in Hanoi facing constant insecurity. In C. McFarlane & M. Waibel, eds. *Urban Informalities: Reflections on the Formal and Informal*. Surrey, England: Ashgate Publishing Limited, pp. 89–110.

Ladou, J. & Lovegrove, S., 2008. Export of electronics equipment waste. *International Journal of Occupational and Environmental Health*, 14(1), pp.1–10.

Lall, S., Suri And, A. & Deichmann, U., 2006. Household savings and residential mobility in informal settlements in Bhopal, India. *Urban Studies*, 43(7), pp.1025–1040.

Land Transport Authority, Singapore, 2014. *Certificate of Entitlement Bidding Results 2014*, Singapore: Land Transport Authority. Available at: http://www.lta.gov.sg/content/dam/ltaweb/corp/PublicationsResearch/files/FactsandFigures/COE_Result_2010_2014.pdf [Accessed: April 20, 2014].

Lapierre, D. & Moro, J., 2009. *Five Past Midnight in Bhopal: The Epic Story of the World's Deadliest Industrial Disaster*, New York: Grand Central Publishing.

Latham, A., 2003. Research, performance, and doing human geography: Some

reflections on the diary-photograph, diary-interview method. *Environment and Planning A*, 35(11), pp.1993–2018.

Laurier, E., 2003. Participant observation, in N.J. Clifford & G. Valentine, eds. *Key Methods in Geography*, London: Sage Publications, pp. 133-148.

Lawhon, M., 2013. Dumping ground or country-in-transition? Discourses of e-waste in South Africa. *Environment and Planning C: Government and Policy*, 31(4), pp.700–715.

Lawhon, M., 2012. Relational power in the governance of a South African e-waste transition. *Environment and Planning A*, 44(4), pp.954–971.

LeBrun, O. & Gerry, C., 1975. Petty producers and capitalism. *Review of African Political Economy*, 2(3), pp.20–32.

Lee, W.K.M., 1998. Income protection and the elderly: An examination of social security policy in Singapore. *Journal of Cross-Cultural Gerontology*, 13, pp.291-307.

Lee, H.C., 2001. Karung guni men beat up worker from recycling firm. *The Straits Times*, August 14, 2001.

Lee, K.Y., 2000. *From Third World to First: The Singapore Story, 1965–2000*, New York: Harper Collins.

Lee, R., 2006. The ordinary economy: tangled up in values and geography. *Transactions of the Institute of British Geographers*, 31(4), pp.413–432.

Lee, R., Leyshon, A., Aldridge, T., Tooke, J., Williams, C. & Thrift, N., 2004. Making geographies and histories? Constructing local circuits of value. *Environment and Planning D: Society and Space*, 22(4), pp.595–617.

Lee, J., Gereffi, G. & Beauvais, J., 2012. Global value chains and agrifood standards: Challenges and possibilites for smallholders in developing countries. *Proceedings of the National Academy of Sciences*, 109(31), pp.12326-12331.

Leong, S., 2005. Millionaire? Who me? *The Straits Times*, August 7, 2005.

Lepawsky, J., 2005a. Digital aspirations: Malaysia and the Multimedia Super Corridor. *Focus on Geography*, 48(3), pp.10–18.

Lepawsky, J., 2005b. Stories of space and subjectivity in planning the Multimedia Super Corridor. *Geoforum*, 36(6), pp.705–719.

Lepawsky, J., 2009. Clustering as anti-politics machine? Situating the politics of regional economic development and Malaysia's Multimedia Super Corridor. *Regional Studies*, 43(3), pp.463–478.

Lepawsky, J., 2012a. Computers and printers, personal waste. In C. A. Zimring & W. L. Rathje, eds. *Encyclopedia of Consumption and Waste: The Social Science of*

*Garbage*. London: SAGE Publications, pp. 144–146.

Lepawsky, J., 2012b. Legal geographies of e-waste legislation in Canada and the US: Jurisdiction, responsibility and the taboo of production. *Geoforum*, 43(6), pp.1194–1206.

Lepawsky, J., 2014. The changing geography of global trade in electronic discards: time to rethink the e-waste problem. *The Geographical Journal*. Advance Access. DOI: 10.1111/geoj.12077 [Accessed: March 15, 2014].

Lepawsky, J. & Billah, M., 2011. Making chains that (un)make things: Waste–value relations and the Bangladeshi rubbish electronics industry. *Geografiska Annaler: Series B, Human Geography*, 93(2), pp.121–139.

Lepawsky, J. & Mather, C., 2011. From beginnings and endings to boundaries and edges: Rethinking circulation and exchange through electronic waste. *Area*, 43(3), pp.242–249.

Lepawsky, J. & McNabb, C., 2010. Mapping international flows of electronic waste. *The Canadian Geographer / Le Géographe Canadien*, 54(2), pp.177–195.

Leslie, D. & Reimer, S., 1999. Spatializing commodity chains. *Progress in Human Geography*, 23(3), pp.401–420.

Leung, A., Cai, Z.W. & Wong, M.H., 2006. Environmental contamination from electronic waste recycling at Guiyu, southeast China. *Journal of Material Cycles and Waste Management*, 8(1), pp.21–33.

Levy, D.L., 2008. Political contestation in global production networks. *Academy of Management Review*, 33(4), pp.943–963.

Liddick, D., 2010. The traffic in garbage and hazardous wastes: an overview. *Trends in Organized Crime*, 13(2-3), pp.134–146.

Lier, D.C., 2007. Places of work, scales of organising: A review of labour geography. *Geography Compass*, 1(4), pp.814–833.

Lim, J., 2007. He grows fortune from discarded computers. *The New Paper*, August 11, 2007.

Lin, K.C. & Tyabji, A., 1991. Home ownership policy in Singapore: An assessment. *Housing Studies*, 6(1), pp.15-28.

Lipietz, A., 1982. The so-called 'transformation problem' revisited. *Journal of Economic Theory*, 26(1), pp.59-88.

Liu, W. & Dicken, P., 2006. Transnational corporations and 'obligated embeddedness': Foreign direct investment in China's automobile industry. *Environment and Planning A*, 38(7), pp.1229–1247.

Liu, X., 2006. Electrical and electronic waste management in China: Progress and

the barriers to overcome. *Waste Management & Research*, 24(1), pp.92–101.

Locke, R., Kochan, T., Romis, M. & Qin, F., 2007. Beyond corporate codes of conduct: Work organization and labour standards at Nike's suppliers. *International Labour Review*, 146(1-2), pp.21–40.

Lombard, M. & Huxley, M., 2011. Self-made cities: Ordinary informality? *Planning Theory & Practice*, 12(1), pp.120–125.

London Metal Exchange, n.d. *London Metal Exchange Official Website* [Online]. Available at: www.lme.com [Accessed: February 10, 2014].

Low, L., 2004. How Singapore's Central Provident Fund fares in social security and social policy. *Social Policy and Society*, 3(3), pp.301-310.

Lum, S., 2002. Karung guni man's sons fight over $14m. *The Straits Times*, November 20, 2002.

Lund, F.J. & Nicholson, J., eds., 2003. *Chains of Production, Ladders of Protection: Social Protection for Workers in the Informal Economy.* Durban, South Africa: School of Development Studies, University of Natal.

Lund-Thomsen, P., 2013. Labor agency in the football manufacturing industry of Sialkot, Pakistan. *Geoforum*, 44, pp.71-81.

Lund-Thomsen, P. & Coe, N.M., 2013. Corporate social responsibility and labour agency: The case of Nike in Pakistan. *Journal of Economic Geography*. Advanced Access. DOI: 10.1093/jeg/lbt041 [Accessed: January 23, 2014].

Lund-Thomsen, P., Nadvi, K., Chan, A., Khara, N. & Xue, H., 2012. Labour in global value chains: Work conditions in football manufacturing in China, India and Pakistan. *Development and Change*, 43(6), pp.1211–1237.

Lundgren, K., 2012. *The Global Impact of E-waste*, Geneva: International Labour Organization.

Lyons, M. & Snoxell, S., 2005. Creating urban social capital: Some evidence from informal traders in Nairobi. *Urban Studies*, 42(7), pp.1077–1097.

MacKinnon, D., 2011. Beyond strategic coupling: Reassessing the firm-region nexus in global production networks. *Journal of Economic Geography*, 12(1), pp.227–245.

Makhoul, J., 2003. An ethnographic study of the consequences of social and structural forces on children: The case of two low-income Beirut suburbs. *Environment and Urbanization*, 15(2), pp.249–260.

Marques, A.C., Marrero, J.-M. & de Fraga Malfatti, C., 2013. A review of the recycling of non-metallic fractions of printed circuit boards. *Springerplus* 2(1), pp.1–11. Available at: http://www.springerplus.com/content/2/1/521 [Accessed: January 20, 2014].

Mars, G. & Nicod, M., 1981. Hidden rewards at work: The implications from a study of British hotels. In S. Henry, ed. *Can I Have It In Cash? A Study of Informal Institutions and Unorthodox Ways of Doing Things*. London: Astragal Books, pp. 58–72.

Marston, S., 2003. A long way from home: Domesticating the social production of scale. In R. McMaster & E. Sheppard, eds. *Scale and Geographic Inquiry: Nature, Society, Method*. Oxford: Blackwell, pp.170-191.

Marx, K., 1956. *Capital Volume II*. F. Engels, ed., Moscow, USSR: Progress Publishers.

Marx, K., 1990. *Capital Volume I*, London: Penguin.

Masocha, M., 2006. Informal waste harvesting in Victoria Falls town, Zimbabwe: Socio-economic benefits. *Habitat International*, 30(4), pp.838–848.

Massari, M. & Monzini, P., 2004. Dirty businesses in Italy: A case-study of illegal trafficking in hazardous waste. *Global Crime*, 6(3-4), pp.285–304.

Mazumdar, D., 1976. The urban informal sector. *World Development*, 4(8), pp.655–679.

McFarlane, C., 2012. Rethinking informality: Politics, crisis, and the city. *Planning Theory & Practice*, 13(1), pp.89–108.

McFarlane, C. & Waibel, M., 2012. Introduction: The informal-formal divide in context. In C. McFarlane & M. Waibel, eds. *Urban Informalities: Reflections on the Formal and Informal*. Surrey, England: Ashgate Publishing Limited, pp. 1–12.

McGee, T.G., 1979. The poverty syndrome: Making out in the Southeast Asian City. In R. Bromley & C. Gerry, eds. *Casual Work and Poverty in Third World Cities*. Chichester: John Wiley & Sons, pp. 45–68.

McKinnon, R., 1996. The public management of national provident funds for state-led development. *International Journal of Public Sector Management*, 9(1), pp.44–60.

McKinnon, R., Charlton, R. & Munro, H., 1997. The national provident fund model: An analytical and evaluative reassessment. *International Social Security Review*, 50(2), pp.43–61.

Meagher, K., 2006. Social capital, social liabilities, and political capital: Social networks and informal manufacturing in Nigeria. *African Affairs*, 105, pp.553-582.

Meagher, K., 2010. *Identity Economics: Social Networks and the Informal Economy in Nigeria*, Suffolk: James Currey.

Medina, M., 2000. Scavenger cooperatives in Asia and Latin America. *Resources,*

*Conservation and Recycling*, 31(1), pp.51–69.

Mezzadri, A., 2008. How globalised production exploits informal-sector workers: Investigating the Indian garment sector, *Development Viewpoint*, 12.

Middleton, A., 1989. The changing structure of petty production in Ecuador. *World Development*, 17(1), pp.139–155.

Mielke, H.W. & Reagan, P.L., 1998. Soil is an important pathway of human lead exposure. *Environmental Health Perspectives*, 106(1), p.217-229.

Mills, M.B., 2003. Gender and inequality in the global labor force. *Annual Review of Anthropology*, 32, pp.41–62.

Mingione, E., 1983. Informalization, restructuring and the survival strategies of the working class. *International Journal of Urban and Regional Research*, 7(3), pp.311-339.

Minter, A., 2011. Malaysia in the Middle. *Scrap*, May/June 2011, pp.52–67. Available at: http://www.scrap.org/ArticlesArchive/2011/May-June/MalaysiaScrapMJ2011.htm [Accessed: January 20, 2013].

Minter, A. & Pollack, R., 2011. Raising the Bar. *Scrap Magazine*, (September/October 2011). Available at: http://www.scrap.org/ArticlesArchive/2011/September-October/AsiaEScrapSO2011.htm [Accessed: January 20, 2013].

Miroudot, S. & De Backer, K., 2012. *Mapping Global Value Chains*. Conference Papers for the OECD Policy Dialogue on Aid for Trade [Online]. Available at: http://www.oecd.org/dac/aft/MappingGlobalValueChains_web_usb.pdf [Accessed: July 10, 2013].

Mitchell, D., 2013. Labour's geography and geography's labour: California as an (anti-) revolutionary landscape. *Geografiska Annaler: Series B, Human Geography*, 95 (3), pp.219–233.

Mitchell, K., Marston, S. & Katz, C., 2003. Life's work: An introduction, review and critique. *Antipode*, 35(3), pp.415-442.

Moore, S.A., 2012. Garbage matters: Concepts in new geographies of waste. *Progress in Human Geography*, 36(6), pp.780–799.

Morrison, A., Pietrobelli, C. & Rabellotti, R., 2008. Global value chains and technological capabilities: A framework to study learning and innovation in developing countries. *Oxford Development Studies*, 36(1), pp.39–58.

Moser, C.O., 1978. Informal sector or petty commodity production: Dualism or dependence in urban development? *World Development*, 6(9), pp.1041–1064.

Mosley, P., 1978. Implicit models and policy recommendations: Policy towards the "informal sector" in Kenya. *IDS Bulletin*, 9(3), pp.3–10.

Muradian, R. & Pelupessy, W., 2005. Governing the coffee chain: The role of voluntary regulatory systems. *World Development*, 33(12), pp.2029-2044.

Murphy, J.T. & Schindler, S., 2010. Globalizing development in Bolivia? Alternative networks and value-capture challenges in the wood products industry. *Journal of Economic Geography*, 11(1), pp.61–85.

Myers, F.R., 2001. *The Empire of Things: Regimes of Value and Material Culture*, Santa Fe, New Mexico: School of American Research Press.

Nadarajan, B., 2004. Karung guni man sues SembWaste. *The Straits Times*, July 16, 2004.

Nadvi, K., 2004. The effect of global standards on local producers: A Pakistani case study. In H. Schmitz, ed. *Local Enterprises in the Global Economy: Issues of Governance and Upgrading*, Cheltenham, UK: Edward Elgar, pp.297-325.

Nadvi, K., 2008. Global standards, global governance and the organization of global value chains. *Journal of Economic Geography*, 8, pp.323-343.

Nadvi, K. & Wältring, F., 2004. Making sense of global standards. In H. Schmitz, ed. *Local Enterprises in the Global Economy: Issues of Governance and Upgrading*, Cheltenham, UK: Edward Elgar, pp.53-94.

Nas, P.J.M. & Jaffe, R., 2004. Informal waste management: Shifting the focus from problem to potential. *Environment, Development and Sustainability*, 6, pp.337-353.

National Environment Agency, Singapore, 2013. *Overview - Waste Management* [Online]. Available at: http://app2.nea.gov.sg/energy-waste/waste-management [Accessed: December 29, 2013].

National Environment Agency, Singapore, 2014. *National Environment Agency Official Website* [Online]. Available at: www.app2.nea.gov.sg [Accessed: March 10, 2014].

Naughton, B., 2007. *The Chinese Economy: Transitions and Growth*, Cambridge, MA: MIT Press.

Neilson, J. & Pritchard, B., 2009. *Value Chain Struggles: Institutions and Governance in the Plantation Districts of South India*, Chichester: Wiley-Blackwell.

Neilson, J., Pritchard, B. & Yeung, H.W.-C., 2014. Global value chains and global production networks in the changing international political economy: An introduction. *Review of International Political Economy*, 21(1), pp.1–8.

Neo, H., 2010. The potential of large-scale urban waste recycling: A case study of the National Recycling Programme in Singapore. *Society & Natural Resources*, 23(9), pp.872–887.

Ni, H.-G. & Zeng, E.Y., 2009. Law enforcement and global collaboration are the keys

to containing e-waste tsunami in China. *Environmental Science & Technology*, 43(11), pp.3991–3994.

Nicholson, C.V., 2010. Chinese carmaker Geely completes acquisition of Volvo from Ford. *The New York Times*, August 2, 2010. Available at: http://www.nytimes.com/2010/08/03/business/global/03volvo.html?_r=0 [Accessed: February 23, 2013].

Nnorom, I.C. & Osibanjo, O., 2008a. Electronic waste (e-waste): Material flows and management practices in Nigeria. *Waste Management*, 28(8), pp.1472–1479.

Nnorom, I.C. & Osibanjo, O., 2008b. Overview of electronic waste (e-waste) management practices and legislations, and their poor applications in the developing countries. *Resources, Conservation and Recycling*, 52(6), pp.843–858.

Nnorom, I.C., Osibanjo, O. & Ogwuegbu, M.O.C., 2011. Global disposal strategies for waste cathode ray tubes. *Resources, Conservation and Recycling*, 55(3), pp.275–290.

Nolan, P. & Zhang, J., 2010. Global competition after the financial crisis. *New Left Review*, 64, pp.97-108.

Nolan, P., Zhang, J. & Liu, C., 2008. The global business revolution, the cascade effect, and the challenge for firms from developing countries. *Cambridge Journal of Economics*, 32(1), pp.29-47.

Norris, L., 2005. Cast(e)-off clothing, *Anthropology Today*, 21(3), p.24.

Norris, L., 2008. Recycling and reincarnation: The journeys of Indian saris. *Mobilities*, 3(3), pp.415–436.

Norris, L., 2010. *Recycling Indian Clothing: Global Contexts of Reuse and Value*, Bloomington, Indiana: Indiana University Press.

Norris, P., 2001. *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide*, Cambridge: Cambridge University Press.

Nzeadibe, T.C. & Anyadike, R.N.C., 2010. Solid waste governance innovations: An appraisal of recent developments in the informal sector niche in urban Nigeria. *Geography Compass*, 4(9), pp.1284–1296.

O'Brien, M., 2008. *A crisis of waste?: Understanding the rubbish society*, London: Routledge.

O'Neill, P., 2007. A public language for analyzing the corporation. In A. Tickell, E. Sheppard, J. Peck & T. Barnes, eds. *Politics and Practice in Economic Geography*. London: SAGE Publications, pp. 119–130.

O'Neill, P. & Gibson-Graham, J.K., 1999. Enterprise discourse and executive talk: Stories that destabilize the company. *Transactions of the Institute of British*

*Geographers*, 24(1), pp.11–22.

OECD, 2007. *Staying Competitive In The Global Economy: Moving Up The Value Chain*. Paris: OECD Publishing.

OECD, 2013. *Interconnected Economies: Benefiting From Global Value Chains*, Paris: OECD Publishing. Available at: http://www.oecd.org/sti/ind/interconnected-economies-GVCs-synthesis.pdf [Accessed: January 2, 2014].

Offe, C. & Heinze, R.G., 1992. *Beyond Employment: Time, Work, and the Informal Economy*, Philadelphia, Pennsylvania: Temple University Press.

Oguchi, M., Murakami, S., Sakanakura, H., Kida, A. & Kameya, T., 2011. A preliminary categorization of end-of-life electrical and electronic equipment as secondary metal resources. *Waste Management*, 31(9-10), pp.2150–2160.

Oguntoyinbo, O.O., 2012. Informal waste management system in Nigeria and barriers to an inclusive modern waste management system: A review. *Public Health*, 126(5), pp.441–447.

Oinas, P., 1999. Voices and silences: The problem of access to embeddedness. *Geoforum*, 30(4), pp.351–361.

Ojeda-Benitez, S., Armijo-de-Vega, C. & Ramírez-Barreto, M.E., 2002. Formal and informal recovery of recyclables in Mexicali, Mexico: Handling alternatives. *Resources, Conservation and Recycling*, 34(4), pp.273–288.

Olsen, W., 1993. Competition and power in rural markets: A case study from Andhra Pradesh. *IDS Bulletin*, 24(3), pp.83–89.

Oro, K. & Pritchard, B., 2011. The evolution of global value chains: Displacement of captive upstream investment in the Australia-Japan beef trade. *Journal of Economic Geography*, 11(4), pp.709–729.

Osibanjo, O. & Nnorom, I.C., 2008. Material flows of mobile phones and accessories in Nigeria: Environmental implications and sound end-of-life management options. *Environmental Impact Assessment Review*, 28(2-3), pp.198–213.

Oteng-Ababio, M., 2012. When necessity begets ingenuity: E-waste scavenging as a livelihood strategy in Accra, Ghana. *Center for African Studies, University of Florida African Studies Quarterly*, 13, pp.1–21.

Palpacuer, F., 2008. Bringing the social context back in: Governance and wealth distribution in global commodity chains. *Economy and Society*, 37(3), pp.393–419.

Palpacuer, F., Gibbon, P. & Thomsen, L., 2005. New challenges for developing country suppliers in global clothing chains: A comparative european perspective. *World Development*, 33(3), pp.409–430.

Pani, E. & Holman, N., 2014. A fetish and fiction of finance: Unraveling the

subprime crisis. *Economic Geography*, 90(2), pp.213–235.

Pant, D., Joshi, D., Upreti, M. & Kotnala, R., 2012. Chemical and biological extraction of metals present in e-waste: A hybrid technology. *Waste Management*, 32(5), pp.979–990.

Pariatamby, A. & Victor, D., 2013. Policy trends of e-waste management in Asia. *Journal of Material Cycles and Waste Management*, 15(4), pp.411-419.

Pavan, M.V., 2013. Singapore, Japan get rich on Bangalore's e-waste - The Times of India. *The Times of India*. September 17, 2013.

Peck, J., 1996. *Work place*, New York: Guildford Press.

Peck, J., 2003. Fuzzy old world: A response to Markusen. *Regional Studies*, 37(6-7), pp.729–740.

Pegler, L. & Knorringa, P., 2007. Integrating labour issues in global value chain analysis: Exploring implications for labour research and unions. In V. Schmidt, ed. *Trade Union Responses to Globalization: A Review by the Global Union Research Network*. Geneva: International Labour Office, pp.35-50.

Perry, G., Maloney, W.F., Arias, O.S., Fajnzylber, P., Mason, A.D. & Saavedra-Chanduvi, J., 2007a. *Informality: Exit and Exclusion*, Washington, D.C.: The World Bank.

Perry, G., Maloney, W.F., Arias, O.S., Fajnzylber, P., Mason, A.D. & Saavedra-Chanduvi, J., 2007b. The Informal Sector: What is it, why do we care and how do we measure it? In *Informality: Exit and Exclusion*. Washington, D.C.: The World Bank, pp. 21–42. Available at: http://siteresources.worldbank.org/INTLAC/Resources/CH1.pdf.

Perry, M. & Hui, T.B., 1998. Global manufacturing and local linkage in Singapore. *Environment and Planning A*, 30(9), pp.1603–1624.

Phillips, N., 2011. Informality, global production networks and the dynamics of "adverse incorporation." *Global Networks*, 11(3), pp.380–397.

Phillips, N., Bhaskaran, R., Nathan, D. & Upendranadh, C., 2011. *Child labour in global production networks: Poverty, vulnerability and "adverse incorporation" in the Delhi garments sector.* Chronic Poverty Research Centre Working Paper No. 177 [Online]. Available at: http://www.chronicpoverty.org/uploads/publication_files/WP177%20Phillips%20et%20al.pdf [Accessed: July 10, 2013].

Pickren, G., 2014a. Geographies of E-waste: Towards a political ecology approach to e-waste and digital technologies. *Geography Compass*, 8(2), pp.111–124.

Pickren, G., 2014b. Political ecologies of electronic waste: Uncertainty and legitimacy in the governance of e-waste geographies. *Environment and Planning A*, 46(1), pp.26–45.

Pietrobelli, C. & Saliola, F., 2008. Power relationships along the value chain: Multinational firms, global buyers and performance of local suppliers. *Cambridge Journal of Economics*, 32(6), pp.947–962.

Pike, A., 2013. Economic geographies of brands and branding. *Economic Geography*, 89(4), pp.317–339.

Pike, A., 2009. Geographies of brands and branding. *Progress in Human Geography*, 33(5), pp.619–645.

Pinto, V., 2008. E-waste hazard: The impending challenge. *Indian Journal of Occupational and Environmental Medicine*, 12(2), pp.65–70.

Ponte, S., 2002. The 'Latte Revolution?' Regulation, markets and consumption in the global coffee chain. *World Development*, 30(7), pp.1099-1122.

Ponte, S. & Gibbon, P., 2005. Quality standards, conventions and the governance of global value chains. *Economy and Society*, 34(1), pp.1–31.

Portes, A., 1978. The informal sector and the world economy: Notes on the structure of subsidised labour. *IDS Bulletin*, 9(4), pp.35–40.

Portes, A. & Sassen-Koob, S., 1987. Making it underground: Comparative material on the informal sector in western market economies. *American Journal of Sociology*, 93(1), pp.30–61.

Portes, A., Blitzer, S. & Curtis, J., 1986. The urban informal sector in Uruguay: Its internal structure, characteristics, and effects. *World Development*, 14(6), pp.727–741.

Powers, W. & Riker, D., 2013. *Exchange rate pass-through in global value chains: The effects of upstream suppliers* [Online]. Washington, D.C.: United States International Trade Commission. Available at: http://www.usitc.gov/publications/332/working_papers/EC201302B.pdf [Accessed March 16, 2014].

Prakash, S. & Manhart, A., 2010. *Socio-economic assessment and feasibility study on sustainable e-waste management in Ghana* [Online]. Freiburg, Germany: Öko-Institut. Available at: http://www.oeko.de/oekodoc/1057/2010-105-en.pdf [Accessed March 19, 2014].

Pratt, G. & Johnston, C., 2007. Putting play to work. In A. Tickell, E. Sheppard, J. Peck & T. Barnes, eds. *Politics and Practice in Economic Geography*. London: SAGE Publications, pp. 71–81.

Puckett, J., Byster, L., Westervelt, S., Gutierrez, R., Davis, S., Hussain, A. & Dutta, M. 2002. *Exporting Harm: The High-Tech Trashing of Asia* [Online]. Seattle, Washington: Basel Action Network. Available at: http://www.ban.org/E-waste/technotrashfinalcomp.pdf [Accessed: December 12, 2011].

Puckett, J., Westervelt, S., Gutierrez, R. & Takamiya, Y., 2005. *The Digital Dump:*

*Exporting Re-use and Abuse to Africa* [Online]. Seattle, Washington: Basel Action Network. Available at: http://www.isf.es/ee/pdf/TheDigitalDumpWeb.pdf [Accessed: June 10, 2012].

Quadros, R., 2004. Global quality standards and technological upgrading in the Brazilian auto-components industry. In H. Schmitz, ed. *Local Enterprises in the Global Economy: Issues of Governance and Upgrading*, Cheltenham, UK: Edward Elgar, pp.265-296.

Quan, K., 2008. Use of global value chains by labor organizers. *Competition & Change*, 12(1), pp.89-104.

Raikes, P., Friis Jensen, M. & Ponte, S., 2000. Global commodity chain analysis and the French filière approach: Comparison and critique. *Economy and Society*, 29(3), pp.390–417.

Rainbird, H., 1991. The self-employed: Small entrepreneurs or disguised wage labourers? In A. Pollert, ed. *Farewell to Flexibility?* Oxford: Blackwell Publishing, pp. 200–214.

Rainnie, A., Herod, A. & McGrath-Champ, S., 2011. Review and positions: Global production networks and labour. *Competition & Change*, 15(2), pp.155–169.

Rainnie, A., Herod, A. & McGrath-Champ, S., 2013. Global production networks, labour and small firms. *Capital & Class*, 37(2), pp.177–195.

Raj-Reichert, G., 2011. The electronic industry code of conduct: Private governance in a competitive and contested global production network. *Competition & Change*, 15(3), pp.221-238.

Raj-Reichert, G., 2013. Safeguarding labour in distant factories: Health and safety governance in an electronics global production network. *Geoforum*, 44, pp.23-31.

Ramasamy, B. & Yeung, M.C.H., 2002. David versus the Goliath: Locational tournament for FDI among developing countries. *Asia Pacific Management Review*, 7(3), pp.299-318.

Rammohan, K.T. & Sundaresan, R., 2003. Socially embedding the commodity chain: An exercise in relation to coir yarn spinning in Southern India. *World Development*, 31(5), pp.903-923.

Raworth, K. & Kidder, T., 2009. Mimicking "lean" in global value chains: It's the workers who get leaned on. In J. Bair, ed. *Frontiers of Commodity Chain Research*. Stanford, California: Stanford University Press, pp. 165–189.

Razmi, A. & Blecker, R.A., 2008. Developing country exports of manufactures: Moving up the ladder to escape the fallacy of composition? *Journal of Development Studies*, 44(1), pp.21–48.

Reddy, R.N., 2013. Revitalising economies of disassembly. *Economic and Political*

*Weekly*, 48(13), pp.62–70.

Reno, J., 2009. Your trash is someone's treasure: The politics of value at a Michigan landfill. *Journal of Material Culture*, 14(1), pp.29–46.

Riisgaard, L., 2009. Global value chains, labor organization and private social standards: Lessons from East African cut flower industries. *World Development*, 37(2), pp.326–340.

Riisgaard, L. & Hammer, N., 2011. Prospects for labour in global value chains: labour standards in the cut flower and banana industries. *British Journal of Industrial Relations*, 49(1), pp.168–190.

Robinson, B.H., 2009. E-waste: An assessment of global production and environmental impacts. *Science of the Total Environment*, 408(2), pp.183–191.

Rochat, D., Rodrigues, W. & Gantenbein, A., 2008. India: Including the existing informal sector in a clean e-waste channel. *Proceedings of the 19th Waste Management Conference of the IWMSA (WasteCon2008).* October 6-10, 2008, Durban, South Africa. Available at: http://ewasteguide.info/Rochat_2008_WasteCon [Accessed: April 12, 2011].

Rossi, A., 2013. Does economic upgrading lead to social upgrading in global production networks? Evidence from Morocco. *World Development*, 46, pp.223–233.

Roy, A., 2005. Urban informality: Toward an epistemology of planning. *Journal of the American Planning Association*, 71(2), pp.147–158.

Ryan, E., 2013. A New Picture of Electronics Exports. *Scrap*, (May/June 2013). Available at: http://www.scrap.org/ArticlesArchive/2013/May-June/ElectronicExports.html [Accessed: October 14, 2013].

Sabot, E.C., 1999. Dr Jekyl, Mr H(i)de: The contrasting face of elites at interview. *Geoforum*, 30(4), pp.329-335.

Saliola, F. & Zanfei, A., 2009. Multinational firms, global value chains and the organization of knowledge transfer. *Research Policy*, 38(2), pp.369–381.

Samad Hadi, A., 2009. Sustainable urban settlement and environmental challenges. *Malaysian Journal of Environmental Management*, 10(2), pp.3–16.

Samad Hadi, A., Idrus, S., Harman Shah, A.H. & Fariz Mohamed, A., 2011. Malaysian path to sustainable development: Transitions to sustainability. *Malaysian Journal of Environmental Management*, 12(2), pp.77–89.

Samuelson, P.A., 1971. Understanding the Marxian notion of exploitation: A summary of the so-called transformation problem between Marxian values and competitive prices. *Journal of Economic Literature*, 9(2), pp.399-431.

Sani, R., 2009. E-waste recycling for the long term. *New Straits Times*, July 20, 2009,

p.14.

Santos, M., 1979. *The Shared Space: The Two Circuits of the Urban Economy in Underdeveloped Countries*. Trans. C. Gerry. London: Methuen.

Saphores, J.-D.M., Nixon, H., Ogunseitan, O.A. & Shapiro, A.A., 2009. How much e-waste is there in US basements and attics? Results from a national survey. *Journal of Environmental Management*, 90(11), pp.3322-3331.

Sari, N.M. & Mokhtar, M.B., 2014. Hazardous waste management in Malaysia: The needs of environmental forensic. In A.Z. Aris, T.H. Tengku Ismail, R. Harun, A.M. Abdullah & M.Y. Ishak, eds. *From Sources to Solution: Proceedings of the International Conference on Environmental Forensics 2013*. Singapore: Springer, pp.61-66.

Sarkar, A., 2008. Occupational and environmental health perspectives of e- waste recycling in India: A review. In R. Johri, ed. *E-waste: Implications, Regulations, and Management in India and Current Global Best Practices*. New Delhi, India: TERI Press, pp. 121–148.

Satchi, M. & Temple, J., 2009. Labor markets and productivity in developing countries. *Review of Economic Dynamics*, 12(1), pp.183–204.

Savage, L. & Wills, J., 2004. New geographies of trade unionism. *Geoforum*, 35(1), pp.5–7.

Schleup, M., Hagelueken, C., Kuehr, R., Magalini, F., Maurer, C., Meskers, C., Mueller, E. & Wang, F., 2009. *Recycling - E-waste to Resource*, Final Report [Online]. Geneva: UNEP. Available at: http://www.unep.org/PDF/PressReleases/E_waste-_publication_screen_FINALVERSION-sml-pdf [Accessed: March 12, 2011].

Schmitz, H., 2006. Learning and earning in global garment and footwear chains. *The European Journal of Development Research*, 18(4), pp.546–571.

Schmitz, H. & Knorringa, P., 2000. Learning from global buyers. *Journal of Development Studies*, 37(2), pp.177–205.

Schoenberger, E., 1997. *The Cultural Crisis of the Firm*, Chichester: Wiley.

Scott, A.M., 1986. Introduction: Why rethink petty commodity production? *Social Analysis*, (20), pp.3–10.

Scott, J.C., 1985. *Weapons of the Weak: Everyday Forms of Peasant Resistance*, London: Yale University Press.

Scott, J.C., 1987. Resistence without protest and without organization: Peasant opposition to the Islamic Zakat and the Christian Tithe. *Comparative Study of Society and History*, 29, pp.417–452.

*Secondhand Dealers Act 1985, Chapter 288* [Online]. Singapore: Government of

Singapore. Available at: http://statutes.agc.gov.sg/aol/search/display/view.w3p;page=0;query=DocId%3A%223136f70a-abf5-4f71-8430-f98b023d7b72%22%20Status%3Apublished%20Depth%3A0;rec=0#legis [Accessed: June 10, 2011].

*Secondhand Goods Dealers Act 2007, Chapter 288A* [Online]. Singapore: Government of Singapore. Available at: http://statutes.agc.gov.sg/aol/search/display/view.w3p;page=0;query=DocId%3A%222ea0c1db-c2b4-4621-8997-679fa7ec358e%22%20Status%3Ainforce%20Depth%3A0;rec=0;whole=yes [Accessed: June 10, 2011].

*Secondhand Goods Dealers Rules 2008* [Online]. Singapore, Government of Singapore. Available at: http://statutes.agc.gov.sg/aol/search/display/view.w3p;page=0;query=CompId%3A6828437d-9b62-4b14-8da7-4863947860d0%20ValidTime%3A20140429000000%20TransactionTime%3A20140429000000;rec=0;resUrl=http%3A%2F%2Fstatutes.agc.gov.sg%2Faol%2Fbrowse%2FtitleResults.w3p%3Bletter%3DS%3Btype%3DactsAll [Accessed: June 10, 2011].

Selwyn, B., 2007. Labour process and workers' bargaining power in export grape production, North East Brazil. *Journal of Agrarian Change*, 7(4), pp.526–553.

Selwyn, B., 2009a. Disciplining capital: Export grape production, the state and class dynamics in northeast Brazil. *Third World Quarterly*, 30(3), pp.519–534.

Selwyn, B., 2009b. Labour flexibility in export horticulture: A case study of northeast Brazilian grape production. *Journal of Peasant Studies*, 36(4), pp.761–782.

Selwyn, B., 2010a. Gender wage work and development in North East Brazil. *Bulletin of Latin American Research*, 29(1), pp.51–70.

Selwyn, B., 2010b. Globalized horticulture: The formation and global integration of export grape production in north east Brazil. *Journal of Agrarian Change*, 10(4), pp.537–563.

Selwyn, B., 2012. Beyond firm-centrism: Re-integrating labour and capitalism into global commodity chain analysis. *Journal of Economic Geography*, 12(1), pp.205–226.

Selwyn, B., 2013. Social upgrading and labour in global production networks: A critique and an alternative conception. *Competition & Change*, 17(1), pp.75–90.

Selwyn, N., 2004. Reconsidering political and popular understandings of the digital divide. *New Media & Society*, 6(3), pp.341–362.

Sen, R. & Srivastava, S., 2009. ASEAN's bilateral preferential trade and economic cooperation agreements: Implications for Asian economic integration. *ASEAN*

*Economic Bulletin*, pp.194–214.

Sepulveda, L. & Syrett, S., 2007. Out of the shadows? Formalisation approaches to informal economic activity. *Policy & Politics*, 35(1), pp.87–104.

Sepúlveda, A., Schluep, M., Renaud, F.G., Streicher, M., Kuehr, R., Hageluken, C. & Gerecke, A.C., 2010. A review of the environmental fate and effects of hazardous substances released from electrical and electronic equipments during recycling: Examples from China and India. *Environmental Impact Assessment Review*, 30(1), pp.28–41.

Servon, L.J., 2008. *Bridging the Digital Divide: Technology, Community and Public Policy*, Chichester: Wiley-Blackwell.

Seton, F., 1957. The 'transformation problem'. *The Review of Economics Studies*, 24(3), pp.149-160.

Shekdar, A.V., 2009. Sustainable solid waste management: An integrated approach for Asian countries. *Waste Management*, 29(4), pp.1438–1448.

Sheppard, E. & Barnes, T.J., 1990. *The capitalist space economy: Geographical Analysis After Ricardo, Marx and Sraffa*, London: Unwin Hyman.

Sherraden, M., Nair, S., Vasoo, S., Ngiam, T.L. & Sherraden, M., 1995. Social policy based on assets: The impact of Singapore's central provident fund. *Asian Journal of Political Science*, 3(2), pp.112–133.

Shrivastava, P., 1992. *Bhopal: Anatomy of a Crisis*, 2nd Edition, London: Paul Chapman Publishing.

Shumon, M.R.H., Ahmed, S. & Islam, M.T., 2014. Electronic waste: Present status and future perspectives of sustainable management practices in Malaysia. *Environmental Earth Sciences*. Advanced Access. DOI: 10.1007/s12665-014-3129-5. [Accessed: March 5, 2014].

Siddiquee, N.A., 2009. Combating corruption and managing integrity in Malaysia: A critical overview of recent strategies and initiatives. *Public Organization Review*, 10(2), pp.153–171.

Simon, D. & Birch, S.L., 1992. Formalizing the informal sector in a changing South Africa: Small-scale manufacturing on the Witwatersrand. *World Development*, 20(7), pp.1029–1045.

Simons, H., 2009. *Case Study Research in Practice*, London: SAGE Publications.

Sin, C.H., 2002. Segregation and marginalisation with public housing: The disadvantaged in Bedok New Town, Singapore. *Housing Studies*, 17(2), pp.267-288.

Sin, C.H., 2003. Interviewing in “place”: The socio-spatial construction of interview data. *Area*, 35(3), pp.305–312.

Singapore Police Force, n.d. *Regulations Under the Secondhand Goods Dealers Act, Cap 288A*. Available at: http://www.spf.gov.sg/licence/SHDL/Others/SHGD%20Regulations.pdf [Accessed: January 20, 2014].

Smart, C., 2009. Shifting horizons: Reflections on qualitative methods. *Feminist Theory*, 10(3), pp.295–308.

Smith, A., 2000. Employment restructuring and household survival in 'post-communist transition': Rethinking economic practices in Eastern Europe. *Environment and Planning A*, 32(10), pp.1759-1780.

Smith, A., 2002a. Culture/economy and spaces of economic practices: Positioning households in post-communism. *Transactions of the Institute of British Geographers*, 27(2), pp.232-250.

Smith, A., 2002b. Economic practices and household economies in Slovakia: Rethinking 'survival' in austerity. In A. Rainnie, A. Smith A. Swain, eds. *Work, Employment and Transition: Restructuring Livelihoods in 'Post-Communist' Eastern Europe*, London: Routledge, pp.227-245.

Smith, A., 2014. The state, institutional frameworks and the dynamics of capital in global production networks. *Progress in Human Geography*. Advance access. Published on February 7, 2014. DOI: 10.1177/0309132513518292 [Accessed: February 8, 2014].

Smith, A. & Stenning, A., 2006. Beyond household economies: Articulations and spaces of economic practice in postsocialism. *Progress in Human Geography*, 30(2), pp.190–213.

Smith, A., Pickles, J., Bucek, M., Pastor, R. & Begg, B., 2014. The political economy of global production networks: Regional industrial change and differential upgrading in the East European clothing industry. *Journal of Economic Geography*. Advance Access. DOI: 10.1093/jeg/lbt039 [Accessed: January 20, 2014].

Smith, A., Rainnie, A., Dunford, M., Hardy, J., Hudson, R. & Sadler, D., 2002. Networks of value, commodities and regions: Reworking divisions of labour in macro-regional economies. *European Urban and Regional Studies*, 26(1), pp.41–63.

Smith, A., Stenning, A., Rochovská, A., & Świątek, D., 2008. The emergence of a working poor: Labour markets, neoliberalisation and diverse economies in post-socialist cities. *Antipode*, 40(2), pp.283–311.

Smith, C.A., 1986. Reconstructing the elements of petty commodity production. *Social Analysis*, (20), pp.29–46.

Smith, C.A., 1989. Survival strategies among petty commodity producers in Guatemala. *International Labor Review*, 128, p.791.

Smith, T., Sonnenfeld, D.A. & Naguib Pellow, D., 2006. *Challenging the Chip: Labor Rights and Environmental Justice in the Global Electronics Industry*, Philadelphia, PA: Temple University Press.

Soesastro, H., 2003. *An ASEAN Economic Community and ASEAN+3: How do they fit together?* The Australian National University Pacific Economic Papers No. 338 [Online]. Canberra: The Australian National University. Available at: https://digitalcollections.anu.edu.au/bitstream/1885/41965/2/pep-338.pdf [Accessed March 18, 2014].

Soo, V.K., Featherston, C. & Doolan, M., 2013. E-waste assessment in Malaysia. In A. Nee, B. Song & S.-K. Ong, eds. *Re-Engineering Manufacturing for Sustainability, Proceedings of the 20th CIRP International Conference on Life Cycle Engineering, Singapore 17-19 April, 2013*. Singapore: Springer, pp. 389-395.

Starosta, G., 2010a. Global commodity chains and the Marxian law of value. *Antipode*, 42(2), pp.433–465.

Starosta, G., 2010b. The outsourcing of manufacturing and the rise of giant global contractors: A Marxian approach to some recent transformations of global value chains. *New Political Economy*, 15(4), pp.543–563.

Stenning, A., Smith, A., Rochovská, A., & Świątek, D., 2010. *Domesticating Neo-Liberalism: Spaces of Economic Practice and Social Reproduction in Post-Socialist Cities*, Chichester: Wiley-Blackwell.

StEP, 2013. *E-Waste World Map* [Online]. Available at: http://step-initiative.org/index.php/WorldMap.html [Accessed March 12, 2014].

Stephenson, J.B., 2008. *Electronic Waste: Harmful US Exports Flow Virtually Unrestricted Because of Minimal EPA Enforcement and Narrow Regulation: Congressional Testimony*, Washington, D.C.: United States Government Accountability Office. Available at: http://www.gao.gov/assets/130/121163.pdf [Accessed: August 10, 2013].

Stevens, C., 2001. Value chains and trade policy: the case of agriculture. *IDS Bulletin*, 32(3), pp.46-59.

Streicher-Porte, M., Widmer, R., Jain, A., Bader, H.-P., Scheidegger, R. & Kytzia, S., 2005. Key drivers of the e-waste recycling system: Assessing and modelling e-waste processing in the informal sector in Delhi. *Environmental Impact Assessment Review*, 25(5), pp.472-491.

Sturgeon, T.J., 2000. *How Do We Define Value Chains and Production Networks?* Background paper prepared for the Bellagio Value Chains Workshop. Bellagio, September 25 - October 1, 2000. MIT IPC Globalization Special Working Paper Series 00-010 [Online]. Available at: http://www.isn.ethz.ch/Digital-Library/Publications/Detail/?ots591=0c54e3b3-1e9c-be1e-2c24-a6a8c7060233&lng=en&id=29407 [Accessed March 10, 2014].

Sturgeon, T.J., 2001. How do we define value chains and production networks? *IDS*

*Bulletin*, 32(3), pp.9–18.

Sturgeon, T.J., 2002. Modular production networks: A new American model of industrial organization. *Industrial and Corporate Change*, 11(3), pp.451–496.

Sturgeon, T.J., 2006. Conceptualizing intergrative trade: The global value chains framework. *Trade Policy Research*, 6, pp.35-72. Available at: http://www.international.gc.ca/economist-economiste/assets/pdfs/research/TPR_2006/Chapter_3_Sturgeon-en.pdf [Accessed: June 8, 2012].

Sturgeon, T.J., 2009. From commodity chains to value chains: Interdisciplinary theory building in an age of globalization. In J. Bair, ed. *Frontiers of Commodity Chain Research*. Stanford, California: Stanford University Press, pp. 110–135.

Sturgeon, T.J., Van Biesebroeck, J. & Gereffi, G., 2008. Value chains, networks and clusters: Reframing the global automotive industry. *Journal of Economic Geography*, 8(3), pp.297–321.

Talbot, J.M., 1997. The struggle for control of a commodity chain: instant coffee from Latin America, *Latin American Research Review*, 32(2), pp.117-135.

Talbot, J.M., 2009. The comparative advantages of tropical commodity chain analysis. In J. Bair, ed. *Frontiers of Commodity Chain Research*. Stanford, California: Stanford University Press, pp. 93–109.

Tan, M., 2001. Karang guni man who gets up to $1,000 a day. *The Straits Times*, April 13, 2001.

Tan, T.-H., 2008. Determinants of homeownership in Malaysia. *Habitat International*, 32(3), pp.318–335.

Tanaka, V., 2009. The “informal sector” and the political economy of development. *Public Choice*, 145(1-2), pp.295–317.

Taylor, M., ed., 2008. *Global Economy Contested: Power and Conflict Across the International Division of Labour*, London: Routledge.

Taylor, P., Newsome, K. & Rainnie, A., 2013. “Putting labour in its place”: Global value chains and labour process analysis. *Competition & Change*, 17(1), pp.1–5.

Tedlock, B., 2003. Ethnography and ethnographic representation, in N.K. Denzin & Y.S. Lincoln, eds. *Strategies of Qualitative Inquiry*, London: Sage Publications, pp.165-213.

Teh, T.L., 1994. From rags and bones to riches - Hup seng huat. *The Business Times*, January 3, 1994.

Tengku-Hamzah, A.A., 2011. *Making Sense of Environmental Governance: A Study of E-waste in Malaysia*. Unpublished PhD Thesis. Durham, UK: Department of Geography, University of Durham.

Teo, E.A.L. & Lin, G., 2011. Determination of strategic adaptation actions for public housing in Singapore. *Building and Environment*, 46(7), pp.1480–1488.

Teo, P. & Huang, S., 1996. A sense of place in public housing: A case study of Pasir Ris, Singapore. *Habitat International*, 20(2), pp.307–325.

*The Straits Times*, 2001. Working for others a pain. *The Straits Times*, September 8, 2001.

Thomas, N., 1991. *Entangled Objects: Exchange, Material Culture, and Colonialism in the Pacific*, Cambridge, MA: Harvard University Press.

Thomsen, L., 2007. Accessing global value chains? The role of business-state relations in the private clothing industry in Vietnam. *Journal of Economic Geography*, 7(6), pp.753-776.

Tokatli, N., 2007. Networks, firms and upgrading within the blue-jeans industry: Evidence from Turkey. *Global Networks*, 7(1), pp.51–68.

Tokman, V.E., 1992. The informal sector in Latin America: From underground to legality. In V. E. Tokman, ed. *Beyond Regulation: The Informal Economy in Latin America*. London: Lynne Rienner, pp. 3–22.

Tran, N., Bailey, C., Wilson, N. & Phillips, M., 2013. Governance of global value chains in response to food safety and certification standards: The case of shrimp from Vietnam. *World Development*, 45, pp.325–336.

Tsing, A., 2009. Supply chains and the human condition. *Rethinking Marxism*, 21(2), pp.148–176.

Turner, S., 2013. *Indonesia's Small Entrepreneurs: Trading on the Margins*, London: Taylor & Francis.

UNCTAD, 2013. *World Investment Report 2013 - Global Value Chains: Investment and Trade For Development* [Online]. Geneva: United Nations. Available at: http://unctad.org/en/PublicationsLibrary/wir2013_en.pdf [Accessed March 18, 2014].

UNCTAD, 2014. *Global Commodities Forum 2014: Global Value Chains, Transparency and Commodity-Based Development Background Note* [Online]. Geneva: United Nations. Available at: http://unctad.org/meetings/en/SessionalDocuments/suc_gcf2014_bn01_en.pdf [Accessed March 18, 2014].

UNCTAD-WTO-OECD, 2013. *Implications Of Global Value Chains For Trade, Investment, Development And Jobs* [Online]. Geneva: United Nations. Available at: http://unctad.org/en/PublicationsLibrary/unctad_oecd_wto_2013d1_en.pdf [Accessed: February 10, 2014].

UN ECLAC, 2008. *Social Panorama for Latin America*. Santiago: Economic

Commission for Latin America and the Caribbean. Available at: http://www.eclac.cl/cgi-bin/getProd.asp?xml=/publicaciones/xml/3/34733/P34733.xml&xsl=/dds/tpl-i/p9f.xsl&base=/tpl-i/top-bottom.xsl# [Accessed: January 20, 2011].

UNEP, 2004a. *State of Waste Management in South East Asia* [Online]. Geneva: UNEP. Available at: http://www.asean.org/archive/files/UNEP.pdf [Accessed March 16, 2014].

UNEP, 2004b. *Vital Waste Graphics*. Geneva: UNEP.

UNEP, 2006. *Vital Waste Graphics 2*. Geneva: UNEP.

UNEP, 2007. *E-Waste Volume II: E-Waste Management Manual* [Online]. Geneva: UNEP. Available at: http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/EWasteManual_Vol2.pdf [Accessed March 16, 2014].

UNEP, 2012. *Vital Waste Graphics 3*. Geneva: UNEP.

UNEP & Secretariat of the Basel Convention, 2002. *Global Trends in Generation and Transboundary Movements of Hazardous Wastes and Other Wastes*. UNEP Basel Convention Series/SBC No. 02/14 [Online]. Geneva: UNEP. Available at: http://archive.basel.int/natreporting/trends2.pdf [Accessed March 18, 2014].

UN-Habitat, 2013. *State of the World's Cities 2012/2013*. Nairobi: United Nations Human Settlements Programme.

Us, V., 2006. Integrating the informal sector into the formal economy: Some policy implications. *Sosyo Ekonomi*, 2(1), pp.94–112.

Vasoo, S. & Lee, J., 2001. Singapore: Social development, housing and the Central Provident Fund. *International Journal of Social Welfare*, 10, pp.276–283.

Velis, C.A., Wilson, D., Rocca, O., Smith, S.R., Mavropoulos, A. & Cheeseman, C.R., 2012. An analytical framework and tool ("InteRa") for integrating the informal recycling sector in waste and resource management systems in developing countries. *Waste Management & Research*, 30(9), pp.43–66.

Vuletin, G., 2008. *Measuring the Informal Economy in Latin America and the Caribbean.* IMF Working Paper WP/08/102 [Online]. Washington, D.C.: International Monetary Fund. Available at: https://www.imf.org/external/pubs/ft/wp/2008/wp08102.pdf [Accessed March 17, 2014].

Wad, P., 2013. Getting international labour rights right at a foreign controlled company in Malaysia: A global labour network perspective. *Geoforum*, 44, pp.52-61.

Walker, S., 2013. World copper: New projects arrive as prices slide. *Engineering and Mining Journal* [Online]. Available at: http://www.e-

mj.com/index.php/features/3239-world-copper-new-projects-arrive-as-prices-slide.html [Accessed March 16, 2014].

Wallerstein, I., 2009. Protection networks and commodity chains in the captialist world-economy. In. J. Bair, ed. *Frontiers of Commodity Chain Research*, Stanford: Stanford University Press, pp.83-89.

Wang, Z., Powers, W. & Wei, S.-J., 2009. *Value Chains in East Asian Production Networks – An International Input-Output Model Based Analysis* [Online]. Washington, D.C.: United States International Trade Commission. Available at: http://www.usitc.gov/publications/332/working_papers/EC200910C.pdf [Accessed March 16, 2014].

Wei, L. & Liu, Y., 2012. Present status of e-waste disposal and recycling in China. *Procedia Environmental Sciences*, 16, pp.506–514.

Wei, Y.H.D. & Liao, F.H.F., 2013. The embeddedness of transnational corporations in Chinese cities: Strategic coupling in global production networks? *Habitat International*, 40(1), pp.82–90.

Whitson, R., 2011. Negotiating place and value: Geographies of waste and scavenging in Buenos Aires. *Antipode*, 43(4), pp.1404–1433.

Widmer, R., Oswald-Krapf, H., Sinha-Khetriwal, D., Schnellmann, M. & Boni, H., 2005. Global perspectives on e-waste. *Environmental Impact Assessment Review*, 25(5), pp.436-458.

Williams, C.C., 2009. Formal and informal employment in Europe: Beyond dualistic representations. *European Urban and Regional Studies*, 16(2), pp.147–159.

Williams, C.C., 2010. Beyond the formal/informal jobs divide: Evaluating the prevalence of hybrid "under-declared" employment in south-eastern Europe. *The International Journal of Human Resource Management*, 21(14), pp.2529–2546.

Williams, C.C. & Round, J., 2007. Beyond negative depictions of informal employment: Some lessons from Moscow. *Urban Studies*, 44(12), pp.2321–2338.

Williams, C.C. & Windebank, J., 1998. *Informal Employment in the Advanced Economies: Implications for Work and Welfare*, London: Routledge.

Williams, C.C. & Windebank, J., 2002. The uneven geographies of informal economic activities: A case study of two British cities. *Work, Employment & Society*, 16(2), pp.231–250.

Williams, E., Kahhat, R., Allenby, B., Kavazanjian, E., Kim, J. & Xu, M., 2008. Environmental, social, and economic implications of global reuse and recycling of personal computers. *Environmental Science & Technology*, 42(17), pp.6446–6454.

Williams, G. & Tumusiime-Mutebile, E., 1978. Capitalist and petty commodity production in Nigeria: A note. *World Development*, 6(9-10), pp.1103–1104.

Wills, J., 2002. Bargaining for the space to organize in the global economy: A review of the Accor-IUF trade union rights agreement. *Review of International Political Economy*, 9(4), pp.675–700.

Wills, J., 2008. Making class politics possible: Organizing contract cleaners in London. *International Journal of Urban and Regional Research*, 32(2), pp.305–323.

Wilson, D.C., Velis, C. & Cheeseman, C., 2006. Role of informal sector recycling in waste management in developing countries. *Habitat International*, 30(4), pp.797–808.

Wolff, R.D., 1982. Marx's (not Ricardo's) 'transformation problem': A radical reconceptualization. *History of Political Economy*, 14(4), pp.564-582.

Wong, A.M., 2010. *Mobile Labour and Worker Resistance Strategies: A Study of Waste Collectors in Singapore*. Unpublished Masters thesis. Singapore: Department of Geography, National University of Singapore.

Wong, M.H., Wu, S.C., Deng, W.J., Yu, X.Z., Luo, Q., Leung, A.O.W., Wong, C.S.C., Luksemburg, W.J. & Wong, A.S., 2007. Export of toxic chemicals – A review of the case of uncontrolled electronic-waste recycling. *Environmental Pollution*, 149(2), pp.131–140.

Wong, P.-K., 1995. Competing in the global electronics industry: A comparative study of the innovation networks of Singapore and Taiwan. *Journal of Industry Studies*, 2(2), pp.35–61.

Wong, P.-K., 1997. Creation of a regional hub for flexible production. *Industry & Innovation*, 4(2), pp.183–205.

Wood, G., 1978. Class formation and 'Antediluvian' capital in Bangladesh. *IDS Bulletin*, 9(3), pp.39–43.

World Economic Forum Company, 2012. *The Shifting Geography of Global Value Chains: Implications for Developing Countries and Trade Policy* [Online], Geneva: World Economic Forum. Available at: http://www3.weforum.org/docs/WEF_GAC_GlobalTradeSystem_Report_2012.pdf [Accessed: February 20, 2014].

WTOIDE-JETRO, 2011. *Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks* [Online], Geneva: World Trade Organization. Available at: http://www.wto.org/english/res_e/booksp_e/stat_tradepat_globvalchains_e.pdf [Accessed: February 20, 2014].

Xue, H. & Chan, A., 2013. The global value chain: Value for whom? The soccer ball industry in China and Pakistan. *Critical Asian Studies*, 45(1), pp.55–77.

Yahaya, N., 1989. Housing in Malaysia, 1955-1990. *Habitat International*, 13(4), pp.63–69.

Yakob, H., Yusof, F. & Hamdan, H., 2012. Land use regulations towards a sustainable urban housing: Klang Valley conurbation. *Procedia - Social and Behavioral Sciences*, 68, pp.578–589.

Yamasue, E., Okumura, H. & Ishihara, K., 2008. Materials stock accounting of electrical and electronic equipments as urban mine. *IEEJ Transactions on Electronics, Information and Systems*, 128(1), pp.6–10.

Yamasue, E., Minamino, R., Numata, T., Nakajima, K., Murakami, S., Daigo, I., Hashimoto, S., Okumura, H. & Ishihara, K., 2009. Novel evaluation method of elemental recyclability from urban mine: Concept of urban ore TMR. *Materials Transactions*, 50(6), pp.1536–1540.

Yang, C., 2009. Strategic coupling of regional development in global production networks: redistribution of Taiwanese personal computer investment from the Pearl River Delta to the Yangtze River Delta, China. *Regional Studies*, 43(3), pp.385–407.

Yang, D.Y.R. & Coe, N.M., 2009. The governance of global production networks and regional development: a case study of Taiwanese PC production networks. *Growth and Change*, 40(1), pp.30–53.

Yeo, S.J. & Heng, C.K., 2014. An (extra)ordinary night out: Urban informality, social sustainability and the night-time economy. *Urban Studies*, 51(4), pp.712-726.

Yeo, S.J., Hee, L. & Heng, C.K., 2012. Urban informality and everyday (night)life: A field study in Singapore. *International Development Planning Review*, 34(4), pp.369–390.

Yeung, H.W.-C., 2003. Practicing new economic geographies: A methodological examination. *Annals of the Association of American Geographers*, 93(2), pp.442–462.

Yeung, H.W.-C., 2005. Rethinking relational economic geography. *Transactions of the Institute of British Geographers*, 30(1), pp.37–51.

Yeung, H.W.-C., 2007. Researching hybridity through 'Chinese' business networks, in A. Tickell, E. Sheppard, J. Peck & T. Barnes, eds. *Politics and Practice in Economic Geography*, London: Sage Publications, pp.279-289.

Yeung, H.W.-C., 2009a. Regional development and the competitive dynamics of global production networks: An East Asian perspective. *Regional Studies*, 43(3), pp.325–351.

Yeung, H.W.-C., 2009b. Transnational corporations, global production networks, and urban and regional development: A geographer's perspective on Multinational enterprises and the global economy. *Growth and Change*, 40(2), pp.197–226.

Yeung, H.W.-C., 2014. Governing the market in a globalizing era: Developmental states, global production networks and inter-firm dynamics in East Asia. *Review of International Political Economy*, 21(1), pp.70–101.

Yeung, H.W.-C. & Lin, G.C.S., 2003. Theorizing economic geographies of Asia. *Economic Geography*, 79(2), pp.107-128.

Yin, R.K., 2003. *Case Study Research: Design and Methods*, Third Edition, London: SAGE Publications.

Young, D., 2013. Chinese firm Geely saves London taxi cab maker Manganese Bronze. *The Telegraph*, February 1, 2013. Available at: http://www.telegraph.co.uk/finance/newsbysector/industry/9841591/Chinese-firm-Geely-saves-London-taxi-cab-maker-Manganese-Bronze.html [Accessed: January 10, 2014].

Yu, J., Williams, E., Ju, M. & Shao, C., 2010. Managing e-waste in China: Policies, pilot projects and alternative approaches. *Resources, Conservation and Recycling*, 54(11), pp.991–999.

Yu, X.Z., Gao, Y., Wu, S.C., Zhang, H.B., Cheung, K.C. & Wong, M.H., 2006. Distribution of polycyclic aromatic hydrocarbons in soils at Guiyu area of China, affected by recycling of electronic waste using primitive technologies. *Chemosphere*, 65(9), pp.1500–1509.

Zhang, L., 2009. From Guiyu to a nationwide policy: E-waste management in China. *Environmental Politics*, 18(6), pp.981–987.

Zheng, L., Wu, K., Li, Y., Qi, Z., Han, D., Zhang, B., Gu, C., Chen, G., Liu, J., Chen, S., Xu, X. & Huo, X., 2008. Blood lead and cadmium levels and relevant factors among children from an e-waste recycling town in China. *Environmental Research*, 108(1), pp.15–20.

Zoeteman, B.C.J., Krikke, H.R. & Venselaar, J., 2009. Handling WEEE waste flows: On the effectiveness of producer responsibility in a globalizing world. *International Journal of Advanced Manufacturing Technology*, 47(5-8), pp.415–436.